**Q1) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1dL1mJF-HBKCcXJ2nNE0kJH7MtGubF61o/view?usp=share\_link**](https://drive.google.com/file/d/1dL1mJF-HBKCcXJ2nNE0kJH7MtGubF61o/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is a reflexive relation?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: A relation is said to be reflexive if every element of the set is related to itself. Here, in this case, i.e., every element is related to itself. Thus, it is a reflexive relation.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q2) Which of the following is not a function?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: In simpler terms, a function is a rule that assigns each input from a set to exactly one output in another set, without repeating any output. Option (a) does not satisfy this condition since 1 is related to both 2 and 3, and 3 is related to 1.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q3) Which of the following is an injective function?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: An injective function is a function in which distinct elements in the domain have distinct images in the range. Option (a) satisfies this condition, as every element in the domain has a unique image in the range. The other options do not satisfy this condition.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q4) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1qcq-BAIZz\_iLyN2lUlDn5duEH0NszEoi/view?usp=share\_link**](https://drive.google.com/file/d/1qcq-BAIZz_iLyN2lUlDn5duEH0NszEoi/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is not a binary relation?**

a)

b)

c)

d) 2

Correct Answer: Option (d)

Explanation: In mathematics, a binary relation is a collection of ordered pairs, where each pair consists of two elements taken from given sets, and it defines a relationship between them. Option (d) is a function equation, not a set of ordered pairs. Hence, it is not a binary relation. The other options are binary relations.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q5) Which of the following is a reflexive and transitive relation, but not symmetric?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: A relation is said to be reflexive if every element of the set is related to itself, transitive if for all , in the relation, is also in the relation, and symmetric if for all in the relation, is also in the relation. satisfies the reflexive and transitive conditions, but not the symmetric condition. The other options do not satisfy all three conditions.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q6) Which of the following is an onto function?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: An onto function is a function in which every element of the range is mapped to by at least one element of the domain. Option (a) satisfies this condition, as every real number can be obtained by adding 1 to some real number. The other options do not satisfy this condition.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q7) Which of the following is an equivalence relation?**

a)

b) {

c)

d)

Correct Answer: Option (c)

Explanation: An equivalence relation is a relation that is reflexive, symmetric, and transitive. Option (c) satisfies all three conditions, as every element is related to itself, the relation is symmetric, and if ( and are in the relation, then is also in the relation. The other options do not satisfy all three conditions.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q8) Which of the following relations is both reflexive and symmetric but not transitive?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: A relation is reflexive if every element of the set is related to itself, symmetric if for all in the relation, is also in the relation, and transitive if for all and in the relation, is also in the relation. Option (c) satisfies the reflexive and symmetric conditions, but not the transitive condition. The other options do not satisfy all three conditions.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q9) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1TC5rYj1UTm5344BHsm7bWoYxRFDb\_OnZ/view?usp=share\_link**](https://drive.google.com/file/d/1TC5rYj1UTm5344BHsm7bWoYxRFDb_OnZ/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following functions is not one-to-one?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: A function is one-to-one if every element of the range is mapped to by at most one element of the domain. Option (b) does not satisfy this condition, as both x and -x map to the same value when x is not 0. The other options satisfy this condition.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q10) Let and . How many functions are there from A to B?**

a) 5

b) 25

c) 125

d) 625

Correct Answer: Option (d)

Explanation: When defining a function from set A to set B, there are 5 possible elements in B for each element in A. Thus, the number of distinct functions from A to B is equal to 5 raised to the power of 5, or 5 multiplied by itself 4 times, which is 625.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q11) Which of the following functions is not continuous at x = 0?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: A function is continuous at a point if its limit at that point exists and is equal to the function value. Option (d) does not satisfy this condition, as its limit at x = 0 does not exist. The other options satisfy this condition.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q12) Which of the following sets is infinite?**

a)

b)

c) {

d)

Correct Answer: Option (b)

Explanation: A set is infinite if it cannot be put into a one-to-one correspondence with any proper subset of itself. Option (b) satisfies this condition, as there are infinitely many even positive integers. The other options are finite.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q13) Let } and Which of the following sets is equal to A ∩ B?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: A ∩ B is the intersection of sets A and B, which means that it contains only the elements that are common to both A and B. In this case, the common elements are 3, 4, and 5, so the set

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q14) Let f(x) = x^2 and g(x) = x + 1. What is the composite function f(g(x))?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The composite function f(g(x)) is obtained by applying the function g(x) to x and then applying the function f(x) to the result. So, .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q15) Let R be a relation on the set defined as Which of the following is true about R?**

a) R is reflexive

b) R is symmetric

c) R is transitive

d) R is not a function

Correct Answer: Option (d)

Explanation: For a relation to be a function, each element in the domain must be related to exactly one element in the range. In this case, and both relate 1 to different elements in the range, so R is not a function.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q16) Let f(x) = 2x - 1 and g(x) = x^2. What is the inverse of the composite function g(f(x))?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The inverse of the composite function is the function that "undoes" , so we want to find a function such that To do this, we can first solve for by applying to both sides of the equation g(f(g^-1(x))) = x, which gives . Then, we can apply to both sides of this equation to get .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q17) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1W8oJm5JrhoRhXnukKzlR0u13bXk8LSxi/view?usp=share\_link**](https://drive.google.com/file/d/1W8oJm5JrhoRhXnukKzlR0u13bXk8LSxi/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is NOT a function?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: A function is a relation between two sets, where each element in the first set is related to exactly one element in the second set. Option (c) is not a function because for some values of x, has two possible values (positive and negative square root of x), which violates the definition of a function.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q18) If and , then = ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: Simplifying further, we get .

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q19) The inverse of the function is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the inverse of a function, we interchange the roles of x and y and solve for y. Starting with , we have . Solving for y, we get , which is the inverse function . Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q20) The composition of relations R and S, where and is**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Composition of two relations R and S, denoted by , is defined as and . Applying this definition to the given relations, we get .

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q21) If the relation and the function, then the composite function is given by**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To find the composite function , we need to substitute the definition of R into f. So.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q22) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1Vyf-PuJtMXUQklEwpC2zVW6Elr4YI0zt/view?usp=share\_link**](https://drive.google.com/file/d/1Vyf-PuJtMXUQklEwpC2zVW6Elr4YI0zt/view?usp=share_link) **)**

**TYPE: Audio**

**The inverse of the function is**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the inverse of a function f, we switch the roles of x and y and solve for y. So, gives , which is the inverse function.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q23) The relation is**

a) an injective function

b) a surjective function

c) a bijective function

d) not a function

Correct Answer: Option (d)

Explanation: A function is a special type of relation in which each element of the domain is associated with exactly one element of the codomain. However, in the given relation R, there are multiple values of y for each x (for example, . Therefore, is not a function. Therefore, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q24) Let be two functions. Find the value of**

a) 22

b) 24

c) 28

d) 30

Correct Answer: Option (b)

Explanation:

Therefore, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q25) The inverse of a function is given by. Find the value of**

a) 4

b) 5

c) 6

d) 7

Correct Answer: Option (d)

Explanation:

If g(x) is the inverse function of , then and for all x in the domain of the functions.

Here, . To find , we need to find the value of x such that .

Thus, .

Therefore, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q26) The function has three roots α, β, and γ. Find the value of**

a) 1

b) 2

c) 3

d) 4

Correct Answer: Option (c)

Explanation:

The sum of the roots of the function is given by the coefficient of divided by the coefficient of . Therefore, .

The sum of the products of every pair of roots is given by the negative of the coefficient of x divided by the coefficient of x³. Therefore, .

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q27) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1cg8O4u6PDIe93PC9x3HLoMjXEP8qdnu0/view?usp=share\_link**](https://drive.google.com/file/d/1cg8O4u6PDIe93PC9x3HLoMjXEP8qdnu0/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is not a property of a relation?**

a) Reflexive

b) Symmetric

c) Transitive

d) Antisymmetric

Correct Answer: Option (d)

Explanation: The properties of a relation are reflexive, symmetric, transitive, and antisymmetric. Reflexive property states that every element of the set is related to itself. Symmetric property states that if x is related to y, then y is related to x. Transitive property states that if x is related to y and y is related to z, then x is related to z. Antisymmetric property states that if x is related to y and y is related to x, then .

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q28) Let and R be a relation on A defined by . Which of the following is true?**

a) R is reflexive but not transitive

b) R is transitive but not reflexive

c) R is both reflexive and transitive

d) R is neither reflexive nor transitive

Correct Answer: Option (c)

Explanation: To check if the relation R is reflexive, we need to check if every element of A is related to itself. Here, and are all in R, as each number is a divisor of itself. Thus, R is reflexive.

To check if R is transitive, we need to check if for every and in R, is also in R. Here, if x is a divisor of y and y is a divisor of z, then x is also a divisor of z. Thus, R is transitive.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q29) Let and . Find the value of .**

a) 13

b) 17

c) 23

d) 33

Correct Answer: Option (c)

Explanation: To find , we need to first find and then substitute the value into . We know that , so . Now, we substitute this value into , so .

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q30) Let be a function defined on the set of positive integers such that and for all , . Find the value of .**

a) 1010

b) 1009

c) 1008

d) 1007

Correct Answer: Option (a)

Explanation: To find the value of , we need to recursively apply the given formula for ) until we reach . Starting with , we have:

To find , we have:

Substituting this into the formula for , we get:

Simplifying, we get:

To find ), we have:

Substituting this into the formula for , we get:

Simplifying, we get:

Continuing in this manner, we eventually reach:

where the number of f's in the above expression is equal to the number of times we applied the formula for . To find the value of we need to determine how many times we need to apply the formula to reach

Note that for all , we have , since is a positive integer less than n. Therefore, we have for all . In particular, we have

Now, we can use induction to show that f(n) is even if n is odd, and odd if n is even. The base case is , which is odd. Now, suppose that is odd for some even n. Then we have:

Since n is even, n-1 is odd, so f(n-1) is even by the induction hypothesis. Therefore, is odd, so is odd. Thus, is odd.

Similarly, suppose that f(n) is even for some odd n. Then we have:

Since n is odd, n-1 is even, so f(n-1) is odd by the induction hypothesis. Therefore, is even, so is odd. Thus, is odd.

Therefore, is odd. Since is odd, we is odd. Therefore, is odd. Continuing in this manner, we see that is odd if the number of f's is odd, and even if the number.

Thus, the correct answer is option(a)

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q31) What is the equation of a straight line passing through the points and ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The equation of a straight line passing through two points and can be found using the formula:

Plugging in the values into this formula gives us:

Simplifying this equation gives us which can be rearranged as

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q32) What is the value of x in the equation ?**

a) 3

b) 5

c) 7

d) 8

Correct Answer: Option (c)

Explanation: To solve for x in this equation, we first add 2 to both sides:

Then we divide both sides by 3

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q33) What is the value of the discriminant of the quadratic equation ?**

a) -4

b) -2

c) 0

d) 4

Correct Answer: Option (d)

Explanation: The discriminant of a quadratic equation is given by the expression .

Plugging in the values a = 1, b = -4, and c = 3 into this expression gives us .

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q34) What is the solution set of the inequality ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To solve this inequality for x, we first add 5 to both sides: .

Then we divide both sides by .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q35) What is the slope of a horizontal line?**

a) 0

b) 1

c) Undefined

d) Infinity

Correct Answer: Option (a)

Explanation: A horizontal line has a slope of , as the line does not rise or fall in the y-direction for any change in . Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q36) What is the value of x in the equation ?**

a) 2

b) 4

c) 6

d) 8

Correct Answer: Option (c)

Explanation: To solve for x in this equation, we first subtract 5 from both sides: .

Then we divide both sides by 2: .

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q37) What is the product of ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: Using the FOIL method, we can expand the expression , which simplifies to .

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q38) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1eaXowgz423f71BlJf8t-jMntpaZhiLDs/view?usp=share\_link**](https://drive.google.com/file/d/1eaXowgz423f71BlJf8t-jMntpaZhiLDs/view?usp=share_link) **)**

**TYPE: Audio**

**What is the midpoint formula for two points and ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The midpoint formula for two points and is , This formula gives the coordinates of the point that lies exactly halfway between the two given points.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q39) What is the discriminant of the quadratic equation ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The discriminant of the quadratic equation is given by the expression . This value helps determine the nature of the roots of the quadratic equation - if the discriminant is positive, the equation has two distinct real roots; if the discriminant is zero, the equation has one real root of multiplicity two; and if the discriminant is negative, the equation has two complex conjugate roots.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Remember

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**Q40) What is the solution of the system of equations and ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To solve the system of equations and , we can use the method of substitution. From the second equation, we can isolate y to get . Substituting this expression for y in the first equation, we get . Solving for x, we get . Substituting this value for x in the second equation, we get .

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q41) What is the domain of the function**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The function has a real output only if the input x satisfies the condition . Solving for x, we get . The domain of the function is the closed interval

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q42) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/136jqyqPzDxROFvqkzNjs8HKmpoNZUGF0/view?usp=share\_link**](https://drive.google.com/file/d/136jqyqPzDxROFvqkzNjs8HKmpoNZUGF0/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is not a polynomial?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: A polynomial is an expression consisting of variables and coefficients, using only the operations of addition, subtraction, and multiplication. The exponent of each variable in a polynomial must be a non-negative integer.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q43) If the roots of the equation are equal, then k is equal to:**

a) 5

b) -5

c) 10

d) -10

Correct Answer: Option (c)

Explanation: For a quadratic equation , the roots are equal if the discriminant is equal to zero. In the given equation , the discriminant is . For the roots to be equal, this must be equal to zero. Therefore, , which implies or 6.25.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q44) The value of k for which the system of equations and has infinitely many solutions is:**

a) -4

b) 4

c) 6

d) -6

Correct Answer: Option (b)

Explanation: The given system of equations can be written in matrix form as:

To have infinitely many solutions, the determinant of this matrix must be zero. Therefore, we have:

Simplifying, we get:

Solving for k, we get:

Substituting this value of k in the original system of equations, we get:

The second equation is a multiple of the first equation, which means that the system has infinitely many solutions.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q45) What is the sum of the roots of the quadratic equation ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: For a quadratic equation , the sum of the roots is given by . In the given equation , the coefficient of x is -5 and the coefficient of is 2.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q46) The value of k for which the equation has real and equal roots is:**

a) 4

b) 8

c) 16

d) 2

Correct Answer: Option (c)

Explanation: For a quadratic equation to have real and equal roots, the discriminant () must be equal to zero. In the given equation , the discriminant is . For the roots to be real and equal, this must be equal to zero. Therefore, , which implies .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q47) If , then the value of is:**

a) 2

b) 4

c) 6

d) 8

Correct Answer: Option (b)

Explanation: To find , we substitute in the expression for

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q48) If the roots of the equation are equal, then is equal to:**

a) 0

b) 1

c) -1

d) 2

Correct Answer: Option (a)

Explanation: For a quadratic equation , the roots are equal if the discriminant () is equal to zero. In the given equation , the discriminant is . Since the roots are equal, this must be equal to zero. Therefore, , which implies that . Therefore, the correct answer is option (a).

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q49) Which of the following is a factorization of the polynomial ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To factorize the polynomial , we can use the Rational Root Theorem to find possible rational roots. The Rational Root Theorem states that if a polynomial has integer coefficients, then any rational root of the polynomial must have a numerator that is a factor of the constant term and a denominator that is a factor of the leading coefficient.

The constant term of the polynomial is 6, which has factors of 1, 2, 3, and 6. The leading coefficient is 1, which has factors of 1. Therefore, the possible rational roots are +/- 1, +/- 2, +/- 3, and +/- 6.

By trying these roots, we find that is a root of the polynomial. We can then use long division or synthetic division to divide the polynomial by which gives us the factorization

To factor the quadratic factor , we can use the quadratic formula or complete the square to find that it factors as Therefore, the overall factorization of the polynomial is .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q50) If a and b are the roots of the equation , what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: By Vieta's formulas, the sum of the roots of the quadratic equation, and the product of the roots is . Therefore, and

Expanding the expression ), we get:

Substituting the values of and , we get:

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q51) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1S7g5n33YKASb59yMbS1C8QBUYN4KmRyi/view?usp=share\_link**](https://drive.google.com/file/d/1S7g5n33YKASb59yMbS1C8QBUYN4KmRyi/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is not a quadratic equation?**

a)

b)

c)

Correct Answer: Option (c)

Explanation: A quadratic equation is an equation of the form , where a, b, and c are constants and a is not equal to zero. Options (a), (b), and (d) are all quadratic equations, while option (c) is a cubic equation with a highest degree of x being 3.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q52) If , then what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation:

.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q53) If the roots of the equation are equal, then what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: If the roots of a quadratic equation are equal, then the discriminant of the equation is zero. The discriminant of the equation . In this case, the discriminant is . Solving for, we get

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q54) If a and b are the roots of the quadratic equation , then what is the value of?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: Using Vieta's formulas, we know that and . Therefore,

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q55) If the sum of the first n terms of an AP is given by , then what is the nth term of the AP?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The sum of the first n terms of an AP is given by ), where a is the first term and d is the common difference. Comparing the given equation, we have . Also, the sum of the first terms is given by . Subtracting this from , we get .

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q56) If a and b are the roots of the quadratic equation , then what is the value of ?**

a)

b)

c) 9

d)

Correct Answer: Option (a)

Explanation: Using Vieta's formulas, we know that and . Also, we have Substituting the values, we get

.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q57) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1S7g5n33YKASb59yMbS1C8QBUYN4KmRyi/view?usp=share\_link**](https://drive.google.com/file/d/1S7g5n33YKASb59yMbS1C8QBUYN4KmRyi/view?usp=share_link) **)**

**TYPE: Audio**

**If the sum of the roots of the quadratic equation is equal to the product of the roots, then what is the value of ?**

a)

b)

c)

d) None of the above

Correct Answer: Option (d)

Explanation: Using Vieta's formulas, we know that the sum of the roots of a quadratic equation is and the product of the roots is Therefore, we have and. Solving these equations, we get . However, the given condition implies that , which gives .

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q58) If a, b, c are distinct real numbers and , then what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: Expanding we get Adding to both sides and factoring, we get . Using the identity , we get . Substituting the value of Solving for , we get

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q59) Let P(x) be a polynomial such that . What is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: Using Lagrange interpolation formula, we can find the unique polynomial of degree at most 3 that passes through the points () and as . Substituting , we get

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q60) If a, b, c are the roots of the cubic equation , what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: Using Vieta's formulas, we know that the sum of the roots of a cubic equation is and the sum of the pairwise products of the roots is c/a. Therefore, we have and . Dividing both sides of the equation by and taking the reciprocal, we get , which implies that

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q61) What is the derivative of with respect to x?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Taking the derivative of f(x) with respect to x, we get .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q62) What is the integral of with respect to ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Integrating f(x) with respect to x, we get . Since C is the constant of integration, we can add any constant value to the integral.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q63) What is the derivative of ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the derivative of a polynomial, you simply take the derivative of each term separately. In this case, the derivative of , the derivative of -, the derivative of, and the derivative of -1 is 0. Therefore, the derivative of is .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q64) What is the limit of as approaches ?**

a)

b)

c)

d) Does not exist

Correct Answer: Option (c)

Explanation: To find the limit of a function as x approaches a certain value, you can simply evaluate the function at that value. However, if you get an indeterminate form (such as or ), you need to use algebraic manipulation or other methods to simplify the function before evaluating it. In this case, we can factor the numerator as and cancel out theterm in the denominator. Then, we are left with the limit of as approaches , which is simply .

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q65) What is the integral of with respect to ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the indefinite integral of a function, you need to reverse the process of taking the derivative. In this case, the derivative of , and the derivative of 3 is 0, so the integral of is simply , which simplifies to . The constant of integration (C) is added because the derivative of a constant is 0, so any constant value could have been added to the integral.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q66) What is the second derivative of ?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To find the second derivative of a function, you need to take the derivative of the derivative. In this case, the derivative of is, and the derivative of. Therefore, the second derivative of .

Thus, the correct answer is option (C).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q67) What is the area enclosed by the curve and the x-axis between and?**

a) 6

b) 8

c) 10

d) 12

Correct Answer: Option (b)

Explanation: To find the area enclosed by a curve and the x-axis, you need to integrate the function with respect to between the given limits. In this case, the integral of between and is evaluated between and . This simplifies to .

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q68) What is the maximum value of the function on the interval ?**

a) 6

b) 12

c) 16

d) 22

Correct Answer: Option (d)

Explanation: To find the maximum value of a function on a given interval, you need to find the critical points and evaluate the function at those points and the endpoints of the interval. In this case, the derivative of is , which has critical points at and . Evaluating the function at these points and the endpoints of the interval, we get , and . Therefore, the maximum value of on the interval is 22.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q69) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1m1o3cC-y2qT\_GFQCDg7Zl4EWaGDGJIKy/view?usp=share\_link**](https://drive.google.com/file/d/1m1o3cC-y2qT_GFQCDg7Zl4EWaGDGJIKy/view?usp=share_link) **)**

**TYPE: Audio**

**What is the derivative of**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To take the derivative of a function that involves a trigonometric function, you need to use the chain rule. In this case, the derivative of with respect to is times the derivative of , which is . Therefore, the derivative of f(x) is .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q70) What is the limit of as x approaches 2?**

a) -1

b) 0

c) 1

d) does not exist

Correct Answer: Option (c)

Explanation: To find the limit of a function as x approaches a given value, you need to substitute the value into the function and simplify. In this case, if we substitute into the function , we get 0/0, which is an indeterminate form. However, if we factor the numerator and denominator, we get , which simplifies to as approaches 2. Plugging in 2, we get , which approaches 1 as x approaches 2.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q71) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1hRngvqdu-42veGfEJM9PY27wl\_mqJZaO/view?usp=share\_link**](https://drive.google.com/file/d/1hRngvqdu-42veGfEJM9PY27wl_mqJZaO/view?usp=share_link) **)**

**TYPE: Audio**

**What is the equation of the tangent line to the curve at the point**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the equation of the tangent line to a curve at a given point, you need to find the derivative of the function and evaluate it at the point to get the slope of the tangent line. In this case, the derivative of . Evaluating this at , we get Therefore, the slope of the tangent line at the point is 4.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q72) What is the area of the region bounded by the curve and the x-axis between**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the area of the region bounded by a curve and the x-axis between two given values of x, you need to integrate the absolute value of the function between those values. In this case, the curve is and the limits of integration are and Therefore, the area is given by the integral of from . This integral can be split into two parts: from , where the function is negative and the absolute value is , and from , where the function is positive and the absolute value is . Therefore, the integral is given by:

Since the integral evaluates to 0, the area of the region bounded by the curve and the x-axis between and is also 0.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy-Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q73) What is the value of the definite integral**

a) 1/2

b) 2/3

c) 3/4

d) 4/5

Correct Answer: Option (c)

Explanation: To evaluate a definite integral, you need to integrate the function and evaluate it at the limits of integration. In this case, the function is sin^3(x) and the limits of integration are 0 and . Therefore, the definite integral is given by:

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q74) What is the area of the region bounded by the curve and the x-axis between and ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the area of the region bounded by a curve and the x-axis between two given values of , you need to integrate the absolute value of the function between those values. In this case, the curve is and the limits of integration are and . Therefore, the area is given by the integral of from -2 to 2. This integral can be split into two parts: from -2 to 0, where the function is negative and the absolute value is , and from 0 to 2, where the function is positive and the absolute value is . Therefore, the integral is given by:

Since the integral evaluates to 0, the area of the region bounded by the curve and the x-axis between x and is also 0.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q75) Which of the following statements is true regarding the graph of a linear equation?**

a) It is always a straight line

b) It can never intersect the x-axis

c) It can only intersect the y-axis at the origin

d) It can have more than one point of intersection with the y-axis

Correct Answer: Option (a)

Explanation: A linear equation is an algebraic equation of the form y = mx + b, where m is the slope of the line and b is the y-intercept. The graph of a linear equation is a straight line, and this is true for all linear equations.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q76) The equation of the tangent to the curve at the point where it cuts the y-axis is:**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To find the equation of the tangent to the curve, we need to find its derivative. Differentiating with respect to x, we get . At the point where the tangent cuts the y-axis, the value of x is 0. Therefore, the slope of the tangent is . The equation of the tangent can be written in point-slope form as where is the point of intersection with the y-axis. Substituting , and we get , which can be simplified to .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q77) The value of is:**

A)

B)

C)

D)

Correct Answer: Option (b)

Explanation: To evaluate the limit, we can use the definition of the exponential function . We can rewrite the given expression as Using the property we can simplify the expression Taking the limit as approaches 0, we get . Since the term approaches 0 faster than , we can ignore it in the limit. Thus, the expression reduces to .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q78) The function has a local minimum at:**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To find the local minimum of the function, we need to find its derivative and set it equal to zero. Differentiating with respect to x, we get . Setting , we get the quadratic equation , which can be factored as . Thus, the critical points of the function are and . To determine whether these are local maxima or minima, we need to use the second derivative test. Differentiating we get . Evaluating and we find that and . Therefore, is a local maximum and is a local minimum. Hence, the answer is , which is the midpoint of the intervaland where the function changes from decreasing to increasing.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q79) The value of the integral dx is:**

a)

b)

Correct Answer: Option (a)

Explanation: To evaluate the integral, we can use the method of partial fractions. Writing the integrand as , we can decompose it as where and are constants. Multiplying both sides by we get . Equating coefficients, we find that and . Therefore, we can rewrite the integrand as and split the integral into two parts. The integral of x is , and the integral of can be evaluated using the substitution and the formula for the inverse tangent function: Combining the two parts, we get

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q80) What is the limit of as approaches 2 for the function**

a) 0

b) 2

c) 4

d) Does not exist

Correct Answer: Option (b)

Explanation: To find the limit of as x approaches , we can simply substitute for in the function and evaluate the resulting expression. However, substituting directly into the function results in an expression that is undefined, since it involves division by 0.

To resolve this issue, we can factor the numerator and simplify the expression:

Now we can substitute 2 for x in the simplified expression and obtain:

Thus, the limit of as x approaches 2 is 4.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q81) What is the derivative of the function ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the derivative of the given function we can apply the power rule of differentiation, which states that the derivative of .

Thus, the derivative of is:

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q82) What is the integral of the function ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the integral of the given function , we need to apply the power rule of integration, which states that the integral of , where C is the constant of integration.

Thus, the integral of is:

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q83) What is the second derivative of the function ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the second derivative of the given function f(x), we need to differentiate the function twice using the power rule of differentiation.

First, we find the first derivative of

Next, we find the second derivative of

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q84) What is the value of the constant k such that the function has a point of inflection at x = 2?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: For a function to have a point of inflection at a certain point , the second derivative of the function must change sign at that point.

Thus, to find the value of the constant k that gives the function a point of inflection at x = 2, we need to find the second derivative of and evaluate it at

First, we find the first and second derivatives of

Next, we substitute into the second derivative and equate the expression to 0 to find the value of :

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q85) Let . Then the number of local maxima of is**

a) 1

b) 2

c) 3

d) 0

Correct Answer: Option (d)

Explanation: The local maxima of a function occurs at critical points where the derivative of the function changes sign from positive to negative. The derivative of is . Setting , we get or . However, for all , which means that the function is concave down everywhere. Therefore, there are no local maxima of

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q86) Let be a polynomial function such that , and . Then the value of is**

a) 16

b) 18

c) 20

d) 22

Correct Answer: Option (d)

Explanation: Since , we have . Also, implies , and implies . Solving these equations, we get . Therefore, .

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q87) Let for all x. Then has**

a) a horizontal asymptote at

b) a vertical asymptote at

c) a vertical asymptote at

d) no asymptotes

Correct Answer: Option (d)

Explanation: To find the horizontal asymptote of we need to find the limit of as approaches infinity or negative infinity. We can divide the numerator and denominator of by to get. As approaches infinity or negative infinity, all the terms in the numerator and denominator with in the denominator go to zero, leaving . Therefore, is a horizontal asymptote of

To find the vertical asymptotes of , we need to solve the equation The discriminant of this quadratic is negative, which means that it has no real roots. Therefore, there are no vertical asymptotes of

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q88) If f, then the maximum value of in is**

a) 2

b) 8

c) 18

d) 20

Correct Answer: Option (c)

Explanation: To find the maximum value of in we need to find the critical points of and then evaluate at these critical points and endpoints of the interval The critical points are the values of where or does not exist. Differentiating we get . Setting , we get or. Evaluating at , and 4, we get and . Therefore, the maximum value of in is .

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q89) If then the tangent to the curve at the point passes through the point**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the equation of the tangent to the curve at the point , we need to find the slope of the tangent at this point. Differentiating with respect to , we get . Substituting we get . Therefore, the slope of the tangent at is . Using the point-slope form of the equation of a straight line, we get the equation of the tangent as which simplifies to . To find the point where this tangent passes through the , we substitute in this equation and solve for . We get . Therefore, the point where the tangent to the curve at passes through the x-axis is , which is closest to .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q90) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1rW4YCblIuUMS4MSL1yoEi-OcwW\_pQ78c/view?usp=share\_link**](https://drive.google.com/file/d/1rW4YCblIuUMS4MSL1yoEi-OcwW_pQ78c/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is the correct statement about the Mean Value Theorem?**

a) If a function is continuous on a closed interval then it attains its maximum and minimum values on that interval

b) If a function is differentiable on a closed interval , then it attains its maximum and minimum values on that interval

c) If a function is continuous on a closed interval then there exists at least one point c in such that the derivative of the function at c is equal to the average rate of change of the function over

d) If a function is differentiable on a closed interval then there exists at least one point c in such that the derivative of the function at c is equal to the average rate of change of the function over

Correct Answer: Option (c)

Explanation: The Mean Value Theorem states that if a function is continuous on the closed interval and differentiable on the open interval then there exists at least one point c in ( such that the derivative of the function at c is equal to the average rate of change of the function over This means that the slope of the tangent line to the curve at c is equal to the slope of the secant line between a and b.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q91) What is the probability of flipping a coin and getting heads?**

a) 0.5

b) 1

c) 0

d) 2

Correct Answer: Option (a)

Explanation: When a fair coin is flipped, there are only two possible outcomes: heads or tails. Each outcome is equally likely, so the probability of getting heads is or .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q92) A card is drawn at random from a deck of 52 cards. What is the probability of getting a face card?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: In a deck of 52 cards, there are 12 face cards (4 jacks, 4 queens, and 4 kings). Therefore, the probability of drawing a face card is , which can be simplified to .

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q93) Two dice are rolled. What is the probability that the sum of the numbers on the two dice is 7?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The possible outcomes of rolling two dice are shown in a 6x6 table, with the numbers on one die along the top and the numbers on the other die along the left side. There are 36 possible outcomes, and 6 of them have a sum of 7: ), and Therefore, the probability of getting a sum of 7 is or .

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q94) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1j3XaHPZl\_QCJ-bjRi56aVyv9GX3YoHAD/view?usp=share\_link**](https://drive.google.com/file/d/1j3XaHPZl_QCJ-bjRi56aVyv9GX3YoHAD/view?usp=share_link) **)**

**TYPE: Audio**

**A fair die is rolled. What is the probability of getting an even number?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: There are six equally likely outcomes when rolling a fair die: 1, 2, 3, 4, 5, or 6. Half of these outcomes are even numbers (2, 4, and 6), so the probability of getting an even number is or .

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q95) Two cards are drawn at random from a deck of 52 cards. What is the probability that both cards are kings?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: There are four kings in a deck of 52 cards. The probability of drawing a king on the first draw is . Since the first card is not replaced, there are now only 51 cards left in the deck, and only three kings. The probability of drawing a king on the second draw given that a king was drawn on the first draw is 3/51. Therefore, the probability of drawing two kings in a row is = .

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q96) A spinner has six equally likely sections labeled 1 through 6. What is the probability of getting a number less than 5?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: There are six equally likely outcomes when spinning the spinner: 1, 2, 3, 4, 5, or 6. Three of these outcomes are less than 5 (1, 2, and 3), so the probability of getting a number less than 5 is or .

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q97) A jar contains 6 red marbles, 4 blue marbles, and 2 green marbles. If one marble is drawn at random from the jar, what is the probability that it is not blue?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: There are 12 marbles in the jar, and 4 of them are blue. Therefore, the probability of drawing a blue marble is or . The probability of not drawing a blue marble is or .

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q98) A bag contains 3 red and 2 blue balls. A ball is drawn randomly and then another ball is drawn randomly without replacing the first ball. What is the probability that both balls are red?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The probability of drawing a red ball on the first draw is . Since the first ball is not replaced, there are now only 4 balls left in the bag, and only 2 of them are red. The probability of drawing a red ball on the second draw given that a red ball was drawn on the first draw is or . Therefore, the probability of drawing two red balls in a row is =

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluiate

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**Q99) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/13NGvuCByjZNqHtpCpbgTuR\_i9Cj1lgMf/view?usp=share\_link**](https://drive.google.com/file/d/13NGvuCByjZNqHtpCpbgTuR_i9Cj1lgMf/view?usp=share_link) **)**

**TYPE: Audio**

**A fair coin is tossed 3 times. What is the probability of getting at least two heads?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: There are 2 possible outcomes when tossing a coin: heads or tails. Therefore, there are possible outcomes when tossing a coin 3 times. There are 3 ways to get 2 heads: HHT, HTH, or THH. There is 1 way to get 3 heads: HHH. Therefore, the probability of getting at least two heads is

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

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**Q100) A box contains 5 red balls, 3 blue balls and 2 green balls. Two balls are drawn randomly. What is the probability that both balls are the same color?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: There are a total of 10 balls in the box. The probability of drawing two red balls is . The probability of drawing two blue balls is . The probability of drawing two green balls is . Therefore, the probability of drawing two balls of the same color is .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q101) In a game, there are 3 red and 2 black cards. A player draws a card at random and replaces it after noting its color. He then draws another card. What is the probability that he draws a red card on the first draw and a black card on the second draw?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The probability of drawing a red card on the first draw is . Since the card is replaced, the probability of drawing a black card on the second draw is also . Therefore, the probability of drawing a red card on the first draw and a black card on the second draw is = .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q102) A die is thrown. What is the probability of getting a multiple of 3?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: A die has six possible outcomes, which are equally likely. Out of these six, two are multiples of 3, which are 3 and 6. Therefore, the probability of getting a multiple of 3 is or .

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q103) Two cards are drawn from a well-shuffled pack of 52 cards. What is the probability of getting two red cards?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The probability of drawing a red card from a well-shuffled pack of 52 cards is or . The probability of drawing another red card after the first one has been drawn is . Therefore, the probability of getting two red cards is , which is approximately equal to .

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q104) A coin is tossed 4 times. What is the probability of getting at least 1 head?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The probability of getting a head on a single toss of a coin is . Therefore, the probability of not getting a head on a single toss of a coin is also . The probability of not getting a head in 4 tosses of a coin is . Therefore, the probability of getting at least 1 head is = .

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q105) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1TgCY\_xje3-vEAwatzRgjF4YQmaZvhFGK/view?usp=share\_link**](https://drive.google.com/file/d/1TgCY_xje3-vEAwatzRgjF4YQmaZvhFGK/view?usp=share_link) **)**

**TYPE: Audio**

**Two dice are thrown simultaneously. What is the probability that the sum of the numbers on the dice is greater than 8?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: There are 36 possible outcomes when two dice are thrown simultaneously. The sum of the numbers on the dice can be greater than 8 in the following cases: and Therefore, there are 8 favorable outcomes. Hence, the probability of the sum of the numbers on the dice being greater than 8 is or , which is approximately equal to .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evalaute

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**Q106) Two dice are thrown simultaneously. What is the probability of getting a sum less than 6?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: There are 36 possible outcomes when two dice are thrown simultaneously, and the sum of the numbers on the dice can range from 2 to 12. The sum is less than 6 for only 4 outcomes: and . Therefore, the probability of getting a sum less than 6 is

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q107) A bag contains 4 red, 5 green and 6 blue balls. If three balls are drawn at random from the bag, what is the probability that at least two of them are blue?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The total number of ways of drawing three balls from the bag is . The number of ways of drawing at least two blue balls is the sum of the number of ways of drawing two blue balls and the number of ways of drawing three blue balls. This is equal to . Therefore, the probability of drawing at least two blue balls is = .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q108) A box contains 5 black balls and 3 white balls. Two balls are drawn at random from the box. What is the probability that one ball is black and one ball is white?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The total number of ways of drawing two balls from the box is= 28. The number of ways of drawing one black ball and one white ball is equal to the product of the number of ways of choosing one black ball from 5 and one white ball from 3, which is = 15. Therefore, the probability of drawing one black ball and one white ball is = .

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q109) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1OWghqCpwOUSklDibPKObyIKErTYG-uf4/view?usp=share\_link**](https://drive.google.com/file/d/1OWghqCpwOUSklDibPKObyIKErTYG-uf4/view?usp=share_link) **)**

**TYPE: Audio**

**A coin is tossed 3 times. What is the probability of getting at least two heads?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The total number of possible outcomes when a coin is tossed 3 times is . The number of outcomes with at least two heads is the sum of the number of outcomes with two heads and the number of outcomes with three heads, which is . Therefore, the probability of getting at least two heads is

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q110) Two fair dice are rolled. The probability that the sum of the numbers obtained is an even number, is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the probability that the sum of two dice rolls is an even number, we need to count the number of ways that can happen. There are 36 possible outcomes when two dice are rolled, and the sum of the numbers on the dice can range from 2 to 12. Out of these 36 outcomes, half of them (18) will be even sums and the other half (18) will be odd sums. Therefore, the probability that the sum of the numbers obtained is an even number is

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q111) A coin is tossed thrice. The probability of getting at most one tail is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The total number of outcomes when a coin is tossed thrice is , since there are two possible outcomes (heads or tails) for each toss. To find the probability of getting at most one tail, we need to count the number of outcomes in which there is either no tail or only one tail. These outcomes are HHH, HHT, HTH, THH, TTT. Therefore, the probability of getting at most one tail is .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q112) The probability that a person will be alive after a certain number of years is . The probability that a person will be alive after twice the number of years is . The probability that a person will be alive after both the periods is . What is the probability that a person will be alive after at least one of the two periods?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: Let A be the event that a person will be alive after the first period and B be the event that a person will be alive after the second period. We know that and

We can find the probability that a person will be alive after at least one of the two periods, using the formula:

Substituting the given values, we get:

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q113) A fair coin is tossed repeatedly. What is the probability of getting at least 3 tails in a row?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The probability of getting a tail in one toss of a fair coin is . The probability of getting 3 tails in a row is . This is because the tosses are independent of each other, so the probability of getting 3 tails in a row is the product of the individual probabilities.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q114) A card is drawn at random from a deck of 52 playing cards. What is the probability that it is a face card or a diamond?**

a)

b)

c)

d) 2

Correct Answer: Option (c)

Explanation: There are 12 face cards and 13 diamonds in a deck of 52 playing cards, with 3 cards that are both face cards and diamonds. The probability of drawing a face card or a diamond is therefore

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q115) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1jnvKslzZS8jOsXpjbOM8yEYDmf3cssQ-/view?usp=share\_link**](https://drive.google.com/file/d/1jnvKslzZS8jOsXpjbOM8yEYDmf3cssQ-/view?usp=share_link) **)**

**TYPE: Audio**

**Two cards are drawn at random from a standard deck of 52 playing cards without replacement. What is the probability that both cards are queens?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: There are 4 queens in a deck of 52 playing cards. The probability of drawing one queen is After the first card is drawn, there are 3 queens left in a deck of 51 cards. The probability of drawing a second queen is therefore . The probability of drawing two queens is the product of these probabilities:

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q116) A bag contains 5 red balls and 3 green balls. Two balls are drawn at random. What is the probability that both balls are green?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The probability of drawing the first green ball is . The probability of drawing the second green ball, given that the first ball was green, is . Therefore, the probability of drawing two green balls is

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q117) In a certain town, 30% of the population are men, and 20% of the population are women who are taller than 6 feet. If a person is chosen at random from the town, what is the probability that the person is a woman who is not taller than 6 feet?**

a) 0.5

b) 0.6

c) 0.7

d) 0.8

Correct Answer: Option (b)

Explanation: The percentage of women who are not taller than 6 feet is Therefore, the probability of choosing a woman who is not taller than 6 feet is . The probability of choosing a man is . The total probability is . Therefore, the probability of choosing a woman who is not taller than 6 feet is

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q118) A box contains 10 cards numbered from 1 to 10. If two cards are drawn at random, what is the probability that their sum is even?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: To have an even sum, we need either both even numbers or both odd numbers. The probability of drawing two even numbers is . The probability of drawing two odd numbers is . Therefore, the probability of drawing two cards with an even sum is . The probability of drawing any two cards is . Therefore, the probability of drawing two cards with any sum is 1. Therefore, the probability of drawing two cards with an odd sum is

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q119) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1\_n4XJnjiuNS3mGFLCIFEn0eFq9kYrV45/view?usp=share\_link**](https://drive.google.com/file/d/1_n4XJnjiuNS3mGFLCIFEn0eFq9kYrV45/view?usp=share_link) **)**

**TYPE: Audio**

**A deck of 52 playing cards is shuffled and 5 cards are drawn at random. What is the probability that the hand contains exactly 3 aces?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The number of ways to choose 3 aces from 4 is The number of ways to choose 2 non-aces from 48 is . The total number of ways to choose 5 cards from 52 is = 2598960. Therefore, the probability of getting exactly 3 aces is

Thus, the correct answer is option (a).

Difficulty Level- Very Hard

Bloom’s Taxonomy- Evaluate

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**Q120) A game involves tossing a fair coin repeatedly until a head appears for the first time. What is the probability that the number of tosses required is odd?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: Let E be the event that the number of tosses required is odd. We can write E as the union of two disjoint events:

The first toss is a head and the number of additional tosses required is even.

The first toss is a tail and the number of additional tosses required is odd.

The probability of the first event is . The probability of the second event can be found using the geometric series formula:

Therefore, the probability of the event E is

Thus, the correct answer is option (b).

Difficulty Level- Very Hard

Bloom’s Taxonomy- Analyze

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**Q121) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1\_RmvgXTEwekproJQTJrHE4nVfUoZGZVt/view?usp=share\_link**](https://drive.google.com/file/d/1_RmvgXTEwekproJQTJrHE4nVfUoZGZVt/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is a vector quantity?**

a) Mass

b) Volume

c) Temperature

d) Displacement

Correct Answer: Option (d)

Explanation: Vector quantities are those quantities that have both magnitude and direction. Displacement is a vector quantity as it has both magnitude (distance covered) and direction (the direction in which the object moved).

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q122) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/179L8NrdZUfTaNgR74lM-uPKF3LfEU0wZ/view?usp=share\_link**](https://drive.google.com/file/d/179L8NrdZUfTaNgR74lM-uPKF3LfEU0wZ/view?usp=share_link) **)**

**TYPE: Audio**

**If two vectors are collinear, what can be said about their cross product?**

a) It will be zero

b) It will be undefined

c) It will be infinity

d) It will be equal to the product of their magnitudes

Correct Answer: Option (a)

Explanation: Collinear vectors are those that lie on the same line or are parallel to each other. The cross product of two collinear vectors is always zero.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q123) What is the unit vector in the direction of the vector ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The unit vector in the direction of a vector is obtained by dividing the vector by its magnitude. The magnitude of vector a is Therefore, the unit vector in the direction of vector a is given by .

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q124) If vector a is parallel to vector b and has a magnitude of 5, what is the magnitude of vector b if its direction is known?**

a) 0

b) 5

c) Cannot be determined

d) Dependent on the direction of vector b

Correct Answer: Option (b)

Explanation: If two vectors are parallel, then they have the same direction or are in opposite directions. Therefore, if the direction of vector a is known and it is parallel to vector b, then vector b must also have the same direction as vector a. The magnitude of vector b can be determined from the magnitude of vector a, as they are parallel. Thus, the magnitude of vector b is also 5.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q124) What is the angle between two perpendicular vectors?**

a) 0 degrees

b) 45 degrees

c) 90 degrees

d) 180 degrees

Correct Answer: Option (c)

Explanation: When two vectors are perpendicular to each other, it means that they form a right angle between them. This can be seen as a 90-degree angle when visualized on a coordinate plane or in three-dimensional space. The concept of perpendicularity is fundamental in many areas of mathematics and physics, such as geometry, trigonometry, and mechanics. In applications, the perpendicularity of vectors is often used to model relationships between physical quantities, such as force and velocity, or to calculate distances and angles between objects.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Remember

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q125) What is the magnitude of the cross product of two parallel vectors?**

a) 0

b) 1

c) Infinity

d) Cannot be determined

Correct Answer: Option (a)

Explanation: Two parallel vectors have the same or opposite direction. The cross product of two parallel vectors is always zero as the sine of the angle between them is zero.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q126) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1v9U3VUaEbnNDPVbzXbsVaVBj64vN9\_1t/view?usp=share\_link**](https://drive.google.com/file/d/1v9U3VUaEbnNDPVbzXbsVaVBj64vN9_1t/view?usp=share_link) **)**

**TYPE: Audio**

**What is the difference between a vector and a scalar?**

a) Vectors have direction and magnitude, while scalars have only magnitude

b) Vectors have only magnitude, while scalars have direction and magnitude

c) Vectors and scalars both have direction and magnitude

d) Vectors and scalars both have only magnitude

Correct Answer: Option (a)

Explanation: A vector is a quantity that has both magnitude and direction, such as displacement or velocity. A scalar is a quantity that has only magnitude, such as mass or temperature.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Remember

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**Q127) If A = and B = , find the unit vector perpendicular to both A and B.**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The cross product of vectors A and B gives a vector perpendicular to both A and B.

which is parallel to

To get a unit vector, we divide the vector by its magnitude.

) and the unit vector is

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q128) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1gaP2\_46\_C52dUMxcITaQUsKmAz32uPR-/view?usp=share\_link**](https://drive.google.com/file/d/1gaP2_46_C52dUMxcITaQUsKmAz32uPR-/view?usp=share_link) **)**

**TYPE: Audio**

**The points A, B and C have position vectors a, b and c respectively. Find the position vector of the point P that divides AB internally in the ratio .**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Let the position vector of point be .

Then, r =

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

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**Q129) If A and B are two vectors such that and the angle between them is 60 degrees, find**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The magnitude of the cross product of two vectors A and B is given by , where theta is the angle between A and B.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q130) If two vectors A and B are such that find the angle between A and B.**

a)

b) 4

c)

d)

Correct Answer: Option (c)

Explanation: Using the cosine rule, we have

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q131) If two vectors have magnitudes 6 and 8 and their scalar product is 4, what is the angle between them?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: If two vectors A and B have magnitudes a and b respectively and their scalar product is c, then , where is the angle between A and B. So, in this case, we have which simplifies to . Therefore, . Since the question asks for the angle between the vectors, and not the angle between the vectors and the x-axis, we take the acute angle between them, which is

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q132) If the magnitude of the vector u is 5 and the magnitude of the vector v is , what is the magnitude of the vector ?**

a) 7

b) 10

c) 13

d) 17

Correct Answer: Option (c)

Explanation: The magnitude of the vector can be found using the formula where is the angle between the vectors u and v. Since the angle between the vectors is not given, we assume that they are orthogonal (i.e., at 90 degrees). In this case, and the formula simplifies to

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

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**Q133) If the vectors and , what is the angle between u and v (in degrees)?**

a) 30

b) 45

c) 60

d) 90

Correct Answer: Option (b)

Explanation: The dot product of two vectors can be used to find the angle between them. The dot product of u and v is . The magnitude of u is and the magnitude of v is . Therefore, the angle between u and v (in degrees) can be found using the formula , which gives . Using a calculator or reference table, we find that the angle θ is approximately 55 degrees.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q134) If the vectors and are orthogonal, what is the value of ?**

a) 1

b) -1

c) 0

d) 2

Correct Answer: Option (c)

Explanation: If two vectors are orthogonal, their dot product is zero. Thus, . Squaring both sides and using the fact , we get

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q135) If the vectors and are coplanar with the vector , what is the value of λ in the vector equation ?**

a) 1/3

b) 1/2

c) 2/3

d) 3/4

Correct Answer: Option (b)

Explanation: If three vectors are coplanar, their scalar triple product is zero. Thus, , where det is the determinant operator and is the matrix whose rows are the vectors , and . Expanding the determinant using the first row, we get. Simplifying, we get . This means that the vector w lies on the line of intersection of the planes containing u and v. The vector equation of this line can be written as , where is a scalar parameter. Substituting the given values, we get Equating the coefficients of i, j, and k, we get the system of equations . Solving these equations, we get .

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q136) If the vector and the vector are two sides of a parallelogram, what is the area of the parallelogram?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The area of a parallelogram with adjacent sides a and b is given by the magnitude of their cross product, ||a x b||. Using the formula for the cross product, we get . Thus,

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

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**Q137) If the vectors and are the adjacent sides of a parallelogram, what is the area of the parallelogram?**

a) 0

b) 1

c) 2

d) 3

Correct Answer: Option (b)

Explanation: The area of the parallelogram formed by the vectors u and v is given by the magnitude of their cross product The cross product of and is , where the semicolon denotes the next row and the comma denotes the next column. Therefore, . Thus, the area of the parallelogram is square units.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

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**Q138) If the angle between the vectors and , what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The dot product of two vectors can be used to find the angle between them. The dot product of and is . The magnitude of u is and the magnitude of v is . Therefore, the angle between and (in radians) can be found using the formula which gives . Using the identity , we get

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q139) If the vectors u = ai + bj + ck and v = xi + yj + zk are parallel, what is the relationship between and ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: If two vectors are parallel, one is a scalar multiple of the other. That is, for some scalar . Writing this out component-wise, we get Equating the corresponding components, we get

Thus, the correct answer is option (b).

Difficulty Level- Medium  
Bloom’s Taxonomy- Evaluate

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**Q140) If the vectors and are the adjacent sides of a parallelogram, what is the length of the diagonal of the parallelogram?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The length of the diagonal of a parallelogram can be found using the Pythagorean theorem. Let be the vector connecting the endpoints of u and v. Then, . The length of w is . Therefore, the length of the diagonal of the parallelogram is , where is the angle between u and v. The dot product of and is . The magnitudes of u and v are . Using the formula for the cosine of the angle between two vectors, we get . Substituting these values, we get the length of the diagonal as

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q141) If a, b, and c are positive scalars and the vectors and are coplanar, what is the value of b/c?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: Three non-collinear vectors are coplanar if and only if their scalar triple product is zero. The scalar triple product of and is given by the determinant . Setting this equal to zero and solving for we get

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q142) If a, b, and c are real numbers such that the vectors , and are mutually perpendicular, what is the value of ?**

a) 0

b) 1

c) 2

d) 3

Correct Answer: Option (a)

Explanation: Three non-zero vectors are mutually perpendicular if and only if their dot products with each other are zero. Thus, we have , and . Solving these equations simultaneously, we get and .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q143) If the vectors and are the adjacent sides of a parallelepiped, what is the volume of the parallelepiped?**

a) 6

b) 8

c) 10

d) 12

Correct Answer: Option (d)

Explanation: The volume of a parallelepiped formed by three non-coplanar vectors a, b, and c is given by the scalar triple product The cross product of b and c is Therefore, Thus, the volume of the parallelepiped is 40 cubic units.

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q144) If the vectors , and are coplanar, what is the value of x?**

a) 5

b) 6

c) 7

d) 8

Correct Answer: Option (b)

Explanation: If three vectors are coplanar, then their scalar triple product is zero. That is, The cross product of b and c is . Therefore Setting this equal to zero and solving for x, we get

Thus, the correct answer is option (b).

Difficulty Level- Hard  
Bloom’s Taxonomy- Evaluate

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**Q145) If a, b, and c are unit vectors such that and , what is the value of ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The scalar triple product gives the signed volume of the parallelepiped formed by the vectors , and . Since are unit vectors, this volume is simply the magnitude of the vector . Using the vector triple product, we get Taking the dot product of this with b, we get

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q146) If the vector and the vector are perpendicular to the vector , what is the possible value(s) of ?**

a)

b)

c

d)

Correct Answer: Option (c) and option (d)

Explanation: If two vectors are perpendicular, their dot product is zero. Therefore, we have , which gives This means that a and b are perpendicular. For c to be perpendicular to both a and b, it must be orthogonal to the plane containing a and b. This plane is spanned by the vectors a and b, and its normal vector is the cross product of a and b. Therefore, c must be parallel to the cross product of a and b. The cross product of a and b is where the semicolon denotes the next row and the comma denotes the next column. Therefore, c must be a scalar multiple of The possible values of c are

Thus, the correct answer is options (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q147) If the vectors , and are the vertices of a parallelepiped, what is the volume of the parallelepiped?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The volume of a parallelepiped is given by the scalar triple product of its three sides. That is, the volume is the absolute value of the dot product of the cross product of two sides with the third side. Therefore, the volume of the parallelepiped formed by the vectors a, b, and c is where a x b is the cross product of a and b. The cross product of a and b , where the semicolon denotes the next row and the comma denotes the next column. Therefore,

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

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**Q148) If a vector is multiplied by a scalar λ and then added to vector , and the resultant vector is parallel to the vector , then the value of is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Let the resultant vector be d. Then,

As d is parallel to c, the direction ratios of d and c must be proportional. So we have:

Solving the above proportion, we get .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q149) The vectors , and are coplanar. Then, the value of is:**

a) −1

b) 0

c) 1

d) 2

Correct Answer: Option (a)

Explanation: Three vectors are coplanar if and only if their scalar triple product is equal to zero. That is, . Let's calculate the value of the scalar triple product:

Now, substituting the given vector c in the above expression and equating it to zero, we get:

Solving the above expression, we get .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q150) Let A and B be two non-zero vectors such that . If the angle between A and B is degrees, then the angle between A and B is:**

a) 60 degrees

b) 45 degrees

c) 30 degrees

d) 15 degrees

Correct Answer: Option (d)

Explanation:

We have

Squaring both sides, we get:

Expanding and simplifying the above expression, we get:

where θ is the angle between A and B.

Since are non-zero, we have

Therefore, the angle between A and B is 90 degrees.

Let α be the angle between A and A+B. Then, we have:

Similarly, let β be the angle between A and A-B. Then, we have:

Since α and β are acute angles, we have:

Therefore, we have:

Substituting the values of and , we get:

Simplifying the above expression, we get:

Taking square root on both sides and simplifying, we get:

Since A and B are non-zero, we have:

Since the angle between A and B is acute, we have:

Therefore, we have:

Thus, the correct answer is option (d).

Difficulty Level- Very Hard

Bloom’s Taxonomy- Evaluate

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**Q151) Which of the following is the equation of a plane in three-dimensional space?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: A plane in the three-dimensional space can be represented by an equation of the form , where are not all zero. Option (b) is the only equation that satisfies this condition.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q152) What is the angle between the x-axis and the line passing through the points and in three-dimensional space?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The angle between two lines in three-dimensional space is given by the dot product of their direction vectors divided by the product of their magnitudes. The direction vector of the line passing through the points and is The direction vector of the x-axis is . The dot product of these vectors is , and the product of their magnitudes is . Therefore, the angle between the x-axis and the line passing through the points is

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q153) What is the distance between the point and the x-axis in three-dimensional space?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The distance between a point and the x-axis in three-dimensional space is given by the distance formula, which is In this case, the point P is (1, 2, 3), so the distance between P and the x-axis is . Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

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**Q154) What is the distance between the points and ?**

a) 4

b) 5

c) 6

d) 7

Correct Answer: Option (d)

Explanation:

The distance between two points and is given by

Using the formula, we get:

Rounding off to the nearest integer, we get the distance as 7.

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q155) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1mUvw42OWI0pkP9FErp0z-MOJ3bQn8PjB/view?usp=share\_link**](https://drive.google.com/file/d/1mUvw42OWI0pkP9FErp0z-MOJ3bQn8PjB/view?usp=share_link) **)**

**TYPE: Audio**

**What is the direction cosine of a line which makes equal angles with the three coordinate axes?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation:

Let the direction cosines of the line be (

Since the line makes equal angles with the three coordinate axes, we have:

where θ is the angle made by the line with each coordinate axis.

Also, we know that the direction cosines satisfy the relation:

Substituting in the above relation, we get:

Since cos θ cannot be negative, we take

Thus, we have:

Taking and (or any permutation of signs), we get the direction cosines of the line as (or any permutation of signs).

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q156) In three-dimensional geometry, what is the distance between the points and )?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The distance between two points and is given by the formula:

Substituting the given values, we get:

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q157) Which of the following is the equation of the plane passing through the points and ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The equation of a plane passing through three non-collinear points and can be found by the following formula:

Substituting the given values, we get:

Simplifying the above equation, we get:

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q158) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/18oiVp6a7RcmI2i5QEo6KDT\_JNCfhuNue/view?usp=share\_link**](https://drive.google.com/file/d/18oiVp6a7RcmI2i5QEo6KDT_JNCfhuNue/view?usp=share_link) **)**

**TYPE: Audio**

**In a rectangular parallelepiped, the opposite faces are**

a) Parallel

b) Perpendicular

c) Intersecting

d) None of the above

Correct Answer: Option (b)

Explanation: In a rectangular parallelepiped, opposite faces are perpendicular to each other. For example, the top and bottom faces of a rectangular box are parallel, while the front and back faces are perpendicular to both the top and bottom faces.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Remember

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**Q159) If three points A, B, and C are collinear, then the area of the triangle ABC is:**

a) 0

b) 1

c) 2

d) 3

Correct Answer: Option (a)

Explanation: If three points A, B, and C are collinear, then they lie on the same line. Therefore, the area of the triangle ABC is 0 because the three points do not form a triangle.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q160) The coordinates of the centroid of a tetrahedron whose vertices are (1, 0, 0), (0, 1, 0), (0, 0, 1), and (a, b, c) are:**

a)

b

c)

d) None of the above

Correct Answer: Option (c)

Explanation: The centroid of a tetrahedron is the point of intersection of its medians. The medians of a tetrahedron are the line segments that join each vertex to the midpoint of the opposite face. The coordinates of the centroid of the tetrahedron with vertices and can be found using the formula Plugging in the values, we get the centroid to be

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q161) What is the distance between the points and**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The distance formula between two points in 3D space is given by:

Substituting the given coordinates, we get:

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q162) Which of the following is a direction vector for the line passing through the points and**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The direction vector of the line passing through two points and is given by:

Substituting the given coordinates, we get:

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q163) What is the equation of the plane passing through the point (1, 2, -3) and perpendicular to the line with direction ratios 2, -1, 3?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The equation of the plane passing through a point and perpendicular to a line with direction ratios is given by:

Substituting the given values, we get:

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q164) What is the distance between the parallel planes and ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The normal vector of both the planes is Therefore, the distance between the two planes is given by the projection of the vector onto the normal vector Using the formula for projection, we have:

Substituting the values, we get:

The magnitude of the projected vector gives us the distance between the planes:

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q165) A line passing through the points and also passes through the point**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The equation of the line passing through two given points is given by:

Simplifying the above equation gives:

Therefore, the equation of the line is:

Substituting the coordinates of option (c) into the equation of the line gives:

Therefore, the line passing through and also passes through

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q166) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/17Mpeq\_5bcOPwbLxAuf7EcrAqspTlCTKd/view?usp=share\_link**](https://drive.google.com/file/d/17Mpeq_5bcOPwbLxAuf7EcrAqspTlCTKd/view?usp=share_link) **)**

**TYPE: Audio**

**The distance between the parallel planes and is**

a) 2

b) 5

c) 10

d) 15

Correct Answer: Option (c)

Explanation: The distance between two parallel planes is given by the absolute value of the difference between their constant terms in the plane equations divided by the square root of the sum of the squares of the coefficients of the variables. Therefore, the distance between the given planes is:

Hence, the distance between the parallel planes is

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q167) Consider a point in 3D space. Which of the following is the equation of a plane which is perpendicular to the line passing through the origin and point P, and also passes through the point ?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The line passing through the origin and point P can be represented by the vector . Any plane that is perpendicular to this line will have a normal vector that is parallel to v. We can find the normal vector by taking the cross product of v with any vector that lies in the plane. For example, we can take the vector >. Then, the normal vector is given by the cross product of v and PQ, i.e., . A plane passing through Q with a normal vector n has the equation , which simplifies to

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q168) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/15YnvHSkhul2IaR49KTZ--p3BFpvUSma0/view?usp=share\_link**](https://drive.google.com/file/d/15YnvHSkhul2IaR49KTZ--p3BFpvUSma0/view?usp=share_link) **)**

**TYPE: Audio**

**Consider a sphere of radius 2 centered at the origin in 3D space. Which of the following points lies on the surface of the sphere?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: A pointlies on the surface of the sphere if and only if it satisfies the equation . Plugging in the coordinates of each point, we find that only option (b) satisfies the equation.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q169) Find the ratio in which the line joining the points and is divided by the .**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: Let the required point be P. Then, the position vector of P can be written as

where A and B are the given points, and k is a constant.

The line joining the two points is given by the vector equation

where

The intersection of this line with the given plane can be found by substituting the values of x, y, and z from the vector equation of the line into the equation of the plane, and solving for t. The value of k can then be found using the ratio in which the line is divided by the plane.

On solving, we get the value of k as . Therefore, the required point P is . Hence, the required ratio is .

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q170) A plane passes through the point and is perpendicular to the plane . Find the equation of the plane.**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Since the given plane is perpendicular to the required plane, the normal vector to the required plane will be parallel to the normal vector of the given plane.

The normal vector of the given plane is Therefore, the normal vector of the required plane will also be .

Let the equation of the required plane be . Since the point lies on the required plane, we have

Also, since the normal vector to the required plane is we have

Solving these two equations, we get , , , and

Therefore, the equation of the required plane is , which is equivalent to

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q171) Which of the following is a vector equation of the plane passing through the point and containing the line of intersection of the planes and ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation:

The line of intersection of the given planes is obtained by solving their equations simultaneously. Subtracting the second equation from the first, we get:

This is the equation of the line L that lies in both the planes.

The required plane passes through the point and contains the line L. Thus, a normal to the plane will be parallel to the direction vector of L, which is

Using the vector equation of a plane, we can write:

where r is the position vector of any point on the plane, and P is the position vector of the given point P(1, 2, 3).

Substituting the values, we get:

Thus, the vector equation of the required plane is

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q172) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1GwFUzYWeFTyumfCKbPbCuOoSAUa7gnC3/view?usp=share\_link**](https://drive.google.com/file/d/1GwFUzYWeFTyumfCKbPbCuOoSAUa7gnC3/view?usp=share_link) **)**

**TYPE: Audio**

**The angle between the line and the plane is**

a) 45 degrees

b) 60 degrees

c) 90 degrees

d) None of the above

Correct Answer: Option (c)

Explanation: The direction ratios of the line are 2, 3, and 4.The normal vector to the plane is . The angle between the line and the plane is given by the formula: where a is the direction vector of the line, n is the normal vector of the plane, and θ is the angle between them.

Substituting the values, we get:

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q173) Which of the following is the angle between the line passing through the point (1, 2, 3) and parallel to the plane , and the plane ?**

a) 45 degrees

b) 60 degrees

c) 90 degrees

d) None of the above

Correct Answer: Option (b)

Explanation: The direction vector of the line passing through the point and parallel to the plane is perpendicular to the normal vector of the plane, which is .

We can find a direction vector of the line by taking any two points on the line and finding their difference. be any point on the line. Then we have:

(equation of the plane)

(substituting for x in terms of y and z)

So, any point on the line can be written as where is a parameter.

The direction vector of the line is obtained by finding the difference between two points on the line

The direction vector is parallel to the normal vector of the plane, so we have:

Solving this equation, we get .

Thus, a direction vector of the line is

The angle between this line and the plane can be found using the formula:

where a is the direction vector of the line and n is the normal vector of the plane. The normal vector of the plane Substituting the values, we get:

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q174) Which of the following is the shortest distance between the lines l1 and l2 given by the vector equations and ?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The direction vectors of the lines l1 and l2 are and respectively.

The shortest distance between two skew lines is given by the formula:

| where a1 and a2 are any two points on the lines l1 and l2 respectively, and n is a unit vector normal to the lines. We can choose the points and . A unit vector normal to both lines is given by the cross product of their direction vectors:

Substituting the values, we get:

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q175) Let P be a point on the line and Q be a point on the line . If the foot of the perpendicular from P to the line PQ is the point ), then the coordinates of Q are**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation:

The direction ratios of the line are , and .

The direction ratios of the line are , and .

Let Q be the point on the line

Then,

Solving, we get:

where t is a parameter.

The foot of the perpendicular from P to the line PQ is the point

Let the position vector of Q be r =

Then, the vector equation of the line PQ is:

The point A lies on the line PQ. Therefore,

where k is a scalar.

Solving, we get:

Thus, the coordinates of Q are:

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q176) Which of the following is the equation of the sphere passing through the point and touching the plane at**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: Let the equation of the sphere be , where is the center of the sphere and r is its radius.

Since the sphere passes through the point , we have:

Also, the given plane is tangent to the sphere at the point . Therefore, the distance between the center of the sphere and the plane is equal to the radius of the sphere.

The distance between the plane and the point is given by:

Since the plane is tangent to the sphere at , we have:

Substituting this in equation (1), we get:

Simplifying and substituting the point (1, -1, 2), we get:

Therefore, the equation of the required sphere is

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q177) A plane passes through the midpoint of the line segment joining the points and and is perpendicular to the line joining the points and The equation of the plane is:**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The vector joining the points and Therefore, the midpoint of this line segment is The vector joining the points . Therefore, the plane is perpendicular to this vector and passes through the point . The equation of the plane passing through the point and perpendicular to the vector is given by . Using this formula, we get the equation of the plane as

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q178) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1FxiGEjIu8ZWzhcjzYVHhtYFhBWOpB0ia/view?usp=share\_link**](https://drive.google.com/file/d/1FxiGEjIu8ZWzhcjzYVHhtYFhBWOpB0ia/view?usp=share_link) **)**

**TYPE: Audio**

**A plane is parallel to the plane whose equation is and passes through the . The equation of the plane is:**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The equation of the given plane is . Any plane parallel to this plane will have the same normal vector. The normal vector of the given plane is Therefore, the equation of the required plane is of the form , where k is a constant. The point lies on this plane. Substituting these values, we get , which gives . Therefore, the equation of the required plane is

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q179) Let A, B, C, and D be four points in space such that AB and CD are perpendicular to each other. The line joining the midpoint of AB to the midpoint of CD is perpendicular to AB and CD. Then, the value of the angle between the lines AC and BD is:**

a) 60 degrees

b) 90 degrees

c) 120 degrees

d) 150 degrees

Correct Answer: Option (b)

Explanation: Let E and F be the mid-points of AB and CD, respectively. As per the problem statement, the line EF is perpendicular to both AB and CD. Therefore, ABFE and EFCF are rectangles. Hence, we have AE = BE = EF = CF, and . Let G be the intersection of lines AC and BD. Now, let us consider triangles ACG and BCG. We have AG = BG (as ), , and . Therefore, triangles ACG and BCG are congruent. Hence, angle ACG = angle BCG. Therefore, the angle between the lines AC and BD is the angle between the planes ACG and BCG, which is the angle between the lines AC and CG in the plane ACG. Now, we have angle ACG = 90 degrees (as AC is perpendicular to EF), and angle GCF = 90 degrees (as GC is perpendicular to EF). Therefore, angle ACG + GCF = 180 degrees. Hence, angle ACG = 90 degrees - GCF. Now, we have angle BCG = angle ACG. Therefore, angle BCD = 90 degrees - GCF. Now, we have angle BCD = 90 degrees - GCF and angle (as CF is perpendicular to CD). Therefore, angle DCF = GCF. Hence, angle ACD = angle . Similarly, we can show that angle BDC = 90 degrees. Therefore, the angle between the lines AC and BD Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q180) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1XoDHt4\_ntLwHmtgkPF3LMF9hdAe9LEfQ/view?usp=share\_link**](https://drive.google.com/file/d/1XoDHt4_ntLwHmtgkPF3LMF9hdAe9LEfQ/view?usp=share_link) **)**

**TYPE: Audio**

**The angle between the line joining the points and and the x-axis is**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The direction ratios of the given line are

Therefore, the

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q181) The area of the region enclosed by the curves and is:**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the area enclosed by the given curves, we need to integrate the difference of the two curves over the given range. The lower limit of integration is x = 0 and the upper limit is the point where the two curves intersect, which is given by . So, the required area is given by:

from 0 to 1

from 0 to 1

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q182) The value of the integral from to is:**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: To evaluate the given integral, we need to integrate the given polynomial over the given range. So, we have:

dx from -

from

=

= (

=

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q183) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1pnHULkJ1JBSRyCfdl\_JDlv1g4bOcICId/view?usp=share\_link**](https://drive.google.com/file/d/1pnHULkJ1JBSRyCfdl_JDlv1g4bOcICId/view?usp=share_link) **)**

**TYPE: Audio**

**The region enclosed by the curve , the y-axis and the line is rotated about the y-axis. The volume of the resulting solid is:**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: To find the volume of the solid obtained by rotating the region enclosed by the given curves about the y-axis, we need to use the formula for the volume of a solid of revolution:

from

Here, the function represents the x-coordinate of the curve , which is given by . So, we have:

from 0 to 8

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q184) What is the definite integral of the function over the interval**

a) 6

b) 9

c) 3

d) 4.5

Correct Answer: Option (b)

Explanation: The definite integral of over the interval is given by . So, the definite integral of over the interval is from

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q185) What is the area enclosed by the curves and between and ?**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The area enclosed between the curves and over the interval is given by . So, the area enclosed by the given curves between and is

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q186) What is the value of the integral ?**

a) 0

b) 1

c) -1

d) π/2

Correct Answer: Option (b)

Explanation: The integral of sin(x) over the interval is given by

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q187) What is the definite integral of a functionover an interval?**

a) The derivative of the function

b) The slope of the function

c) The area under the curve of the function between the limits a and b

d) The limit of the function as x approaches infinity

Correct Answer: Option (c)

Explanation: The definite integral of a function over an interval gives the area under the curve of the function between the limits a and b. This can be written as . The definite integral is a number that represents the signed area between the function and the x-axis.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q188) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1bjMw3P7FsGLy-RMfALz52M-S-lLw24co/view?usp=share\_link**](https://drive.google.com/file/d/1bjMw3P7FsGLy-RMfALz52M-S-lLw24co/view?usp=share_link) **)**

**TYPE: Audio**

**What is the indefinite integral of a function ?**

a) The derivative of the function

b) The slope of the function

c) The area under the curve of the function

d) The limit of the function as x approaches infinity

Correct Answer: Option (a)

Explanation: The indefinite integral of a function is another function such that , where represents the derivative of . In other words, the indefinite integral is the reverse operation of differentiation. It is denoted by

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q189) Which method is used to find the area between two curves?**

a) Derivatives

b) Integrals

c) Limits

d) Approximations

Correct Answer: Option (b)

Explanation: To find the area between two curves, we use the method of integration. We subtract the lower curve from the upper curve and integrate the resulting function between the intersection points of the curves. This gives the area between the curves. This can be expressed as , where is the upper curve and is the lower curve.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q190) Evaluate the integral dx.**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: We can use the substitution method to solve this integral. Let , then du = . Solving for in terms of , we get . Substituting the values in the integral, we get . Integrating with respect to u, we get . Substituting back the value of u, we get . Simplifying, we get

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q191) Find the area bounded by the curve and the x-axis between and .**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: To find the area bounded by the curve and x-axis, we need to integrate the function with respect to x between the limits -1 and 2. Thus, the area is given by the integral Integrating the function, we get . Substituting the limits, we get

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q192) The value of is:**

a) π/8

b) π/4

c) π/2

d) None of these

Correct Answer: Option (a)

Explanation:

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q193) The value of is:**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation:

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q194) Let , then the value of the integral between the limits and is:**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The given integral can be written as:

Expanding the above expression, we get:

Integrating the above expression, we get:

Putting the limits of integration and in the above expression, we get:

=

=

=

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q195) Let then the value of the integral between the limits and is:**

a) 3/2

b) 2/3

c) π/4

d) π/3

Correct Answer: Option (c)

Explanation: The given integral can be written as:

Using the identity c), the above expression can be simplified as:

Putting the limits of integration x=0 and x=π/2 in the above expression, we get:

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q196) Find the area enclosed by the curves and the lines .**

a)

b)

c)

d)

Correct answer: (a)

Explanation: The curves and . So, the area enclosed by the curves between x = 0 and x = π/4 is given by the integral dx from . Similarly, the area enclosed by the curves between is given by the integral from . Therefore, the total area enclosed by the curves is:

Rounding off to one decimal place, we get the answer as 1.7, which is closest to option (a).

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

**Q197) Find the area of the region bounded by the curve , the x-axis and the lines and**

a)

b)

c)

d)

Correct answer: (b)

Explanation: To find the area of the region bounded by the given curve, the x-axis and the two vertical lines, we need to integrate the absolute value of the function between the limits -1 and 3. So, the area is:

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Apply

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q198) The area of the region enclosed by the curve and the lines and is:**

a) 1

b) 2

c) 3

d) 4

Correct answer: b) 2

Explanation: We can split the given region into two parts by finding the x-coordinate of the point where the curve intersects the x-axis. This occurs when . So, the two regions are: (i) the region between the x-axis and the curve for , and (ii) the region between the x-axis and the curve

The area of the first region is given by the definite integral:

The area of the second region is given by the definite integral:

Therefore, the total area enclosed by the curve and the given lines is:

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q199) What is the formula to find the area between two curves and over the interval**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The formula to find the area between two curves and over the interval is given by the definite integral . This formula represents the absolute difference between the two functions and integrated over the interval The absolute value is necessary to ensure that the area is always positive.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q200) What is the formula for finding the centroid of a plane region R with density function**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the centroid of a plane region R with density function is given by the double integral This formula represents the weighted average of the x and y coordinates of the region, where the weight is given by the density function The division by the area ensures that the centroid is a point inside the region.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q201) What is the formula for finding the volume of a solid of revolution obtained by rotating the curveabout the x-axis over the interval**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the volume of a solid of revolution obtained by rotating the curve about the x-axis over the interval [ is given by the definite integral . This formula represents the volume of a cylindrical shell with radius and height , which is obtained by rotating a small segment of the curve about the x-axis. Integrating over the entire interval gives the total volume of the solid.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q202) What is the formula to find the arc length of a smooth curve over the interval**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula to find the arc length of a smooth curve over the interval is given by the definite integral . This formula represents the distance traveled by a particle moving along the curve from . The square root term ensures that the distance traveled is always positive, and the derivative term in the radical represents the slope of the tangent line at each point.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q203) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1oiodHncbpvKdbz4mO\_8D87KUZuEWM07d/view?usp=share\_link**](https://drive.google.com/file/d/1oiodHncbpvKdbz4mO_8D87KUZuEWM07d/view?usp=share_link) **)**

**TYPE: Audio**

**What is the formula for finding the average value of a function f(x) over the interval [a,b]?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the average value of a functionover the interval is given by the definite integral . This formula represents the average height of the function over the interval, where the height is weighted by the length of the interval. The division by ensures that the average value is a constant, regardless of the length of the interval.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Remember

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q204) What is the formula for finding the work done by a force moving an object along a smooth curve C from to**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the work done by a force moving an object along a smooth curve from to is given by the line integral · dr, where · denotes the dot product and dr represents a differential element of the curve. This formula represents the work done by the force in moving the object along the curve, where the force is weighted by the displacement of the object. The dot product ensures that only the component of the force in the direction of the displacement contributes to the work done.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Remember

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q205) What is the formula for finding the volume of a solid of revolution obtained by rotating the region bounded by the curve the x-axis, and the lines and , about the y-axis?**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The formula for finding the volume of a solid of revolution obtained by rotating the region bounded by the curve the x-axis, and the lines and , about the y-axis is given by the definite integral . This formula represents the sum of the volumes of thin cylindrical shells formed by rotating each vertical strip about the y-axis. The thickness of each shell is dx, and its radius is given by .

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q206) What is the formula for finding the centroid of a plane region R with respect to the x-axis?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the centroid of a plane region R with respect to the x-axis is given by the double integral , where A is the area of the region R. This formula represents the x-coordinate of the centroid, which is the balance point of the region. The division by A ensures that the x-coordinate is a weighted average of the x-coordinates of all the points in the region, with each point weighted by its area.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q207) What is the formula for finding the surface area of a surface of revolution obtained by rotating the curve ) over the interval about the x-axis?**

a)

b

c)

d)

Correct Answer: Option (c)

Explanation: The formula for finding the surface area of a surface of revolution obtained by rotating the curve over the interval , about the x-axis is given by the definite integral . This formula represents the sum of the areas of thin cylindrical strips formed by rotating each horizontal strip about the x-axis. The thickness of each strip is dx, and its radius is given by ). The square root term represents the length of the arc of the curve over each strip, which is used to find the surface area.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q208) What is the formula for finding the volume of a solid of revolution obtained by rotating the curve around the x-axis over the interval**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the volume of a solid of revolution obtained by rotating the curve around the x-axis over the interval is given by the definite integral . This formula represents the sum of the volumes of infinitesimally thin disks, each with radius and thickness , obtained by slicing the solid perpendicular to the axis of rotation. The factor of arises from the circular cross-section of the disks.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q209) What is the formula for finding the area of the surface obtained by rotating the curve around the x-axis over the interval**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The formula for finding the area of the surface obtained by rotating the curve around the x-axis over the interval is given by the definite integral . This formula represents the sum of the areas of infinitesimally thin rings, each with radius and thickness , obtained by slicing the surface parallel to the axis of rotation. The factor of arises from the circular cross-section of the rings.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q210) What is the formula for finding the moment of inertia of a planar region R about the y-axis?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The formula for finding the moment of inertia of a planar region R about the y-axis is given by the double integral . This formula represents the resistance of the region to rotational motion about the y-axis. The term ensures that the resistance is always positive and proportional to the distance from the axis of rotation.

Thus, the correct answer is option (b).

Difficulty Level- Very Hard

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q211) What is the derivative of the function ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the derivative of the given function we differentiate each term of the function using the power rule of differentiation. The derivative of , the derivative of is 2, and the derivative of is . Therefore, the derivative of is .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q212) What is the value of**

a) 2

b) 4

c) 0

d) Does not exist

Correct Answer: Option (b)

Explanation: To find the limit of the given function as x approaches 2, we can try to simplify the expression by factoring the numerator. The numerator can be written as which cancels out with the denominator Thus, the limit simplifies to the value of the numerator when x equals 2, which is 4.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q213) What is the indefinite integral of the function ?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: To find the indefinite integral of the given function we integrate each term of the function using the power rule of integration. The indefinite integral of , the indefinite integral of , the indefinite integral of is , and the indefinite integral of is . Therefore, the indefinite integral of , where C is the constant of integration.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q214) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1OUmd5g4qMuTvvhn36hyeOsE4fnLHghS8/view?usp=share\_link**](https://drive.google.com/file/d/1OUmd5g4qMuTvvhn36hyeOsE4fnLHghS8/view?usp=share_link) **)**

**TYPE: Audio**

**What is the area under the curve between the limits a and b called?**

a) Definite Integral

b) Indefinite Integral

c) Derivative

d) Function

Correct Answer: Option (a)

Explanation: The area under the curve between the limits a and b is called the definite integral. It is denoted by .

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q215) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/12rPMzjVHlbF4aVVAdDRKyZEwLIACQ0EU/view?usp=share\_link**](https://drive.google.com/file/d/12rPMzjVHlbF4aVVAdDRKyZEwLIACQ0EU/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is an application of calculus?**

a) Finding the area of a circle

b) Solving a quadratic equation

c) Calculating the velocity of an object in motion

d) Simplifying algebraic expressions

Correct Answer: Option (c)

Explanation: Calculus has various applications in real-world scenarios. One such application is calculating the velocity of an object in motion. Calculus helps in finding the instantaneous rate of change, which can be used to calculate the velocity of an object at a given point in time. Thus, option (c) is the correct answer.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Remember

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**Q216) Which of the following is an example of an indefinite integral?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: An indefinite integral is an antiderivative of a function. It is denoted by . Option (b) represents the indefinite integral of the function , which is .

Thus, option (b) is the correct answer.

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q217) If , then the value of is:**

a) 16

b) 14

c) 10

d) 8

Correct Answer: Option (b)

Explanation: We can find the derivative of y with respect to x using the power rule of differentiation, which states that if , then . Applying this to , we get Substituting , we get .

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q218) The value of the integral from is:**

a) 10

b) 8

c) 6

d) 4

Correct Answer: Option (c)

Explanation: Using the integration formula for linear functions, we get m, where C is the constant of integration. Evaluating this between the limits and , we

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q219) If and , then the value of the integral is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: We can use partial fraction decomposition to express as a sum of simpler fractions. Dividing by , we get:

Now, we can use the method of substitution to evaluate the integral of the first term, and the method of partial fractions to evaluate the integral of the second term. Thus,

=

where C is the constant of integration.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q220) The area of the region bounded by the curves and is:**

a) 1/6

b) 1/3

c) 1/2

d) 1

Correct Answer: Option (b)

Explanation: The curves and intersect at and Therefore, we can split the region into two parts: one from to and the other from to . By integrating the area of each part separately, we get the total area as square units.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q221) The value of the definite integral is:**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: We can use the substitution to simplify the integral. After substitution, the integral becomes , which can be easily evaluated as . Substituting back we get the final answer as .

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q223) The volume of the solid generated by revolving the region bounded by the curves and about the y-axis is:**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: To find the volume, we can use the formula , where r is the radius of the cross-section perpendicular to the axis of revolution. In this case, the radius is given by , and the limits of integration are and . Evaluating the integral, we get the volume as cubic units.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q224) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1Z5KclYlVnwJE4x-jbVobSRjG7o1vJc\_M/view?usp=share\_link**](https://drive.google.com/file/d/1Z5KclYlVnwJE4x-jbVobSRjG7o1vJc_M/view?usp=share_link) **)**

**TYPE: Audio**

**If f(x) is an odd function, which of the following is true?**

a) is odd

b) is even

c) is periodic

d) is a constant function

Correct Answer: Option (b)

Explanation: If is odd, then for all . Differentiating both sides of this equation with respect to x, we get Hence, is an even function.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Remember

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q225) The slope of the tangent to the curve at the point is**

a) -2

b) -1

c) 0

d) 1

Correct Answer: Option (b)

Explanation: The slope of the tangent to the curve at a point is given by Hence, the slope of the tangent to the curve y at the point is given by . Therefore, the slope of the tangent is (since it is perpendicular to the line ).

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q226) The area enclosed by the curve , x-axis and the line is:**

a) 1/3

b) 1/2

c) 1/6

d) 1/4

Correct Answer: Option (a)

Explanation: The given curve intersects the x-axis at and and the line at and Therefore, the area enclosed by the curve, x-axis, and the line is given by the integral from 0 to 1 of . Evaluating this integral, we get which is the correct answer.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q227) If the function is continuous on then the value of the definite integral is:**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The given integral can be written as . Using the substitution in the second integral, we get . Therefore, the given integral simplifies to . Adding we get the final answer as option (c).

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q228) The area enclosed between the parabolas and is:**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The given curves intersect at and Therefore, the required area is given by the integral from to of + the integral from to of . Evaluating these integrals, we get the final answer as

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q229) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1gEJmwswBhqTVn3w60qySuRdKo917T-GV/view?usp=share\_link**](https://drive.google.com/file/d/1gEJmwswBhqTVn3w60qySuRdKo917T-GV/view?usp=share_link) **)**

**TYPE: Audio**

**The rate of change of volume of a sphere with respect to its radius r is**

a)

b)

c)

d)

Correct Answer: Option (d)

Explanation: The volume V of a sphere of radius r is given by . Differentiating with respect to r, we get . Thus, the rate of change of volume with respect to r is .

Thus, the correct answer is option (d).

Difficulty Level- Medium  
Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q230) If the integral of with respect to x over the interval is F, then the integral of with respect to x over the interval is equal to**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: Let Then and Substituting these in the integral, we get

But , since they cover the same interval. Thus, we have

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q231) The area of the region enclosed by the curves and is:**

a) 5/3

b) 8/3

c) 11/6

d) 13/6

Correct Answer: Option (b)

Explanation: We can draw the graph of the given curves and find the points of intersection. The graphs intersect at and We can find the area of the region by splitting it into two parts and integrating each separately. The area enclosed by and the x-axis from to is given by:

The area enclosed by and the x-axis from to is given by:

Therefore, the total area enclosed by the curves is

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q232) The function is defined for all real numbers. The area bounded by the curve the x-axis and the lines and is:**

a) 16/3

b) 20/3

c) 24/3

d) 28/3

Correct Answer: Option (c)

Explanation: We can find the area bounded by the curve y = f(x), the x-axis, and the lines x = -1 and x = 1 by integrating the function from -1 to 1:

However, we also need to take into account the parts of the curve that lie below the x-axis. We can do this by finding the roots of the quadratic equation , which are complex. Since the function is defined for all real numbers, this means that the entire curve lies above the x-axis. Therefore, the area bounded by the curve, the x-axis, and the lines and is simply .

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q233) Let and , for all real numbers . Find the area bounded by the curves , and the x-axis in the interval**

a)

b)

c)

d)

Correct Answer: Option (c)

Explanation: The area bounded by the curves can be found by subtracting the area under the curve from the area under the curve in the interval Thus, the required area is given by the integral . Simplifying, we get:

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q234) The curve passes through the origin and satisfies the differential equation , where . If , find the value of**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The given differential equation can be solved by separating the variables and integrating both sides. We get:

Using the initial condition , we get Thus, for all . Therefore, . Hence, the correct answer is option (b).

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q235) Let f(x) be a continuous function on such that . Find the value of the integral**

a) 1/3

b) 1/2

c) 2/3

d) 3/4

Correct Answer: Option (c)

Explanation: We can use integration by parts to evaluate the given integral. Let and . Then, and

Using the formula for integration by parts, we get:

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q236) A body of mass 2 kg moves under the force N where x is in meters. If the initial velocity of the body is 4 m/s, then the time required by the body to come to rest is:**

a)

b)

c)

d) None of these

Correct Answer: Option (a)

Explanation: The force acting on the body is , so the acceleration of the body is . Using the equation of motion , where and (as the body comes to rest), we get . Thus, . We need to find the value of when the body comes to rest, i.e., when the velocity is zero. At this point, we have , where k is the spring constant. Using the initial velocity and kinetic energy, we get . Now, , so . Substituting the value of k, we get . Therefore, seconds.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q237) The rate of change of the area of a circle with respect to its radius is equal to the circumference of the circle. If the area of the circle is sq. units, then the radius of the circle is:**

a) 8 units

b) 4 units

c) 2 units

d) None of these

Correct Answer: Option (b)

Explanation: Let r be the radius of the circle. Then, its area . Using the given information, we have , where C is the circumference of the circle. So, , where d is the diameter of the circle. Hence, we get . Using this value, we get units.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q238) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/15vTNIuf8buChosFXP4C\_dbQT8idEMpVi/view?usp=share\_link**](https://drive.google.com/file/d/15vTNIuf8buChosFXP4C_dbQT8idEMpVi/view?usp=share_link) **)**

**TYPE: Audio**

**Let be a twice differentiable function defined for all x. If for all , then which one of the following is true?**

a) is a polynomial of degree at most 1

b) is a polynomial of degree at most 2

c) is a polynomial of degree at most 3

d) is a polynomial of degree at most 4

Correct Answer: Option (b)

Explanation: If for all , then is a linear function. Integrating gives which is a quadratic function. Therefore, is a polynomial of degree at most 2.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q239) Let be a continuous function defined for all x. If for all x and for all x, then which one of the following is true?**

a) is a decreasing function

b) is an increasing function

c) is a constant function

d) is an oscillating function

Correct Answer: Option (a)

Explanation: Since for all x, is a decreasing function. This means that the function is decreasing at that point, and since this holds true for all x, the function is decreasing everywhere. Therefore, the statement "Since for all is a decreasing function is correct.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q240) Let f(x) be a differentiable function defined on the interval If and is continuous, then which one of the following is true?**

a) There exists a value of x insuch that

b) There exists a value of x in ( such that

c) for all x in

d) can take on both positive and negative values on the interval

Correct Answer: Option (b)

Explanation: By the Mean Value Theorem, there exists a value of c in such that Since is continuous, . Thus, there exists a value of x in such that

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q241) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1Uhcj-9nE\_gjjGAogW9uVAt4teLks-ilM/view?usp=share\_link**](https://drive.google.com/file/d/1Uhcj-9nE_gjjGAogW9uVAt4teLks-ilM/view?usp=share_link) **)**

**TYPE: Audio**

**What is the equation of a linear regression line?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The equation of a linear regression line is of the form , where m is the slope of the line and b is the y-intercept. This equation can be used to predict the value of y for a given value of x, based on the relationship between the two variables.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Remember

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**Q242) What is the purpose of finding the correlation coefficient in linear regression?**

a) To determine the strength and direction of the linear relationship between two variables

b) To determine the intercept of the regression line

c) To determine the slope of the regression line

d) To determine the standard deviation of the data

Correct Answer: Option (a)

Explanation: The correlation coefficient is a measure of the strength and direction of the linear relationship between two variables. It ranges from , with values closer to indicating a strong negative relationship, values closer to 1 indicating a strong positive relationship, and values closer to 0 indicating no or weak relationship. Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

**Q243) What is the coefficient of determination in linear regression?**

a) A measure of the strength of the linear relationship between two variables

b) A measure of the proportion of variation in the dependent variable that is explained by the independent variable

c) A measure of the standard error of estimate

d) A measure of the slope of the regression line

Correct Answer: Option (b)

Explanation: The coefficient of determination, also known as R-squared, is a measure of the proportion of variation in the dependent variable that is explained by the independent variable in a linear regression model. It ranges from 0 to 1, with higher values indicating a stronger relationship between the variables.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- remember

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**Q244) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/11TcBmORWvz0XkgOw5qRqWMN9ggKCO\_Nr/view?usp=share\_link**](https://drive.google.com/file/d/11TcBmORWvz0XkgOw5qRqWMN9ggKCO_Nr/view?usp=share_link) **)**

**TYPE: Audio**

**What is the equation of a linear regression line?**

a)

b)

c)

d)

Correct Answer: Option (b)

Explanation: The equation of a linear regression line is of the form , where m is the slope of the line and b is the . This equation can be used to predict the value of y for a given value of , based on the relationship between the two variables.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q245) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1KThhqvTmnzy1MlQQ9xSDuk783mQOo\_OO/view?usp=share\_link**](https://drive.google.com/file/d/1KThhqvTmnzy1MlQQ9xSDuk783mQOo_OO/view?usp=share_link) **)**

**TYPE: Audio**

**What is the purpose of finding the correlation coefficient in linear regression?**

a) To determine the strength and direction of the linear relationship between two variables

b) To determine the intercept of the regression line

c) To determine the slope of the regression line

d) To determine the standard deviation of the data

Correct Answer: Option (a)

Explanation: The correlation coefficient is a measure of the strength and direction of the linear relationship between two variables. It ranges from , with values closer to indicating a strong negative relationship, values closer to 1 indicating a strong positive relationship, and values closer to 0 indicating no or weak relationship. Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q246) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1gGRouIgmWyjK89CQlag5i-4wyKg6xFTb/view?usp=share\_link**](https://drive.google.com/file/d/1gGRouIgmWyjK89CQlag5i-4wyKg6xFTb/view?usp=share_link) **)**

**TYPE: Audio**

**What is linear regression?**

a) A method to find the roots of an equation

b) A technique to plot data points on a graph

c) A statistical method to model the relationship between two variables

d) A way to estimate probabilities in a dataset

Correct Answer: Option (c)

Explanation: Linear regression is a statistical method used to model the relationship between two variables by fitting a linear equation to the observed data. The goal is to find the line of best fit that minimizes the difference between the predicted values and the actual values of the dependent variable. This technique is used to make predictions or to understand the relationship between two variables, such as the relationship between a person's height and weight.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Remember

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**Q247) Which of the following is the equation for a straight line?**

a) y = 2x^2 + 3x + 1

b) y = 3sin(x) - 2

c) y = 5x - 7

d) y = 1/x

Correct Answer: Option (c)

Explanation: The equation for a straight line in slope-intercept form is , where m is the slope and b is the y-intercept. Option (c)is in this form, with slope and y-intercept . Options (a) and (b) are not linear functions because they contain quadratic and trigonometric terms respectively. Option (d) is also not linear because it contains an inverse function.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q248) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1VXBaXfwsUMStV2HlbQMhcwI509H8E8mB/view?usp=share\_link**](https://drive.google.com/file/d/1VXBaXfwsUMStV2HlbQMhcwI509H8E8mB/view?usp=share_link) **)**

**TYPE: Audio**

**What is the correlation coefficient?**

a) A measure of how closely two variables are related

b) The slope of the line of best fit in a linear regression

c) The difference between the predicted and actual values of the dependent variable

d) The probability of observing a certain value in a dataset

Correct Answer: Option (a)

Explanation: The correlation coefficient is a measure of how closely two variables are related to each other. It is represented by the symbol r and ranges from , where a value of 1 indicates a perfect positive correlation, 0 indicates no correlation, and -1 indicates a perfect negative correlation. The correlation coefficient is calculated by dividing the covariance of the two variables by the product of their standard deviations. Options (b), (c), and (d) are incorrect because they do not define the correlation coefficient.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Evaluate

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**Q249) Which of the following statements is true about the residual plot in linear regression analysis?**

a) The residuals should be randomly distributed around zero with no clear pattern.

b) The residuals should be normally distributed with a mean of zero and a constant variance.

c) The residuals should have a positive linear trend.

d) The residuals should have a negative linear trend.

Correct Answer: Option (a)

Explanation: In linear regression analysis, the residual plot is used to check the goodness of fit of the linear model. The residuals are the differences between the observed values of the dependent variable and the predicted values of the dependent variable. The residual plot should be examined to ensure that the residuals are randomly distributed around zero with no clear pattern. This indicates that the model is a good fit for the data. Options (b), (c), and (d) are incorrect because they describe patterns that should not be present in the residual plot.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q250) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1GvUEs-E7hv9qumLoyINAig7VX5S9y8Qv/view?usp=share\_link**](https://drive.google.com/file/d/1GvUEs-E7hv9qumLoyINAig7VX5S9y8Qv/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following methods can be used to select the best-fit line in linear regression?**

a) Method of least squares

b) Method of maximum likelihood

c) Method of moments

d) Method of stochastic gradient descent

Correct Answer: Option (a)

Explanation: The method of least squares is a commonly used method for selecting the best-fit line in linear regression analysis. This method involves minimizing the sum of the squared differences between the observed values of the dependent variable and the predicted values of the dependent variable. The line that minimizes this sum is the line of best fit. Options (b), (c), and (d) are incorrect because they are not used to select the best-fit line in linear regression analysis.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q251) What is the coefficient of determination in linear regression analysis?**

a) A measure of how closely the observed values of the dependent variable fit the predicted values of the dependent variable.

b) A measure of the strength and direction of the linear relationship between two variables.

c) A measure of the slope of the line of best fit in a linear regression.

d) A measure of the standard deviation of the residuals in a linear regression.

Correct Answer: Option (a)

Explanation: The coefficient of determination, also known as R-squared, is a measure of how closely the observed values of the dependent variable fit the predicted values of the dependent variable. It is a value between 0 and 1, with a value of 1 indicating a perfect fit and a value of 0 indicating no fit. The coefficient of determination is calculated by squaring the correlation coefficient between the observed values of the dependent variable and the predicted values of the dependent variable. Options (b), (c), and (d) are incorrect because they do not define the coefficient of determination.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q252) Which of the following is a disadvantage of using linear regression analysis?**

a) It assumes a linear relationship between the independent and dependent variables.

b) It cannot handle non-linear relationships between the independent and dependent variables.

c) It is sensitive to outliers in the data.

d) All of the above.

Correct Answer: Option (d)

Explanation: Linear regression analysis has several disadvantages. First, it assumes a linear relationship between the independent and dependent variables, which may not always be the case. Second, it cannot handle non-linear relationships between the independent and dependent variables. Third, it is sensitive to outliers in the data, which can significantly affect the results.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q253) In a simple linear regression model, which of the following represents the slope of the line of best fit?**

a) The y-intercept of the line of best fit

b) The coefficient of determination

c) The correlation coefficient

d) The coefficient of the independent variable

Correct Answer: Option (d)

Explanation: In a simple linear regression model, the slope of the line of best fit represents the change in the dependent variable (y) for every one-unit change in the independent variable (x). The slope is represented by the coefficient of the independent variable in the linear regression equation. Options (a), (b), and (c) are incorrect because they do not represent the slope of the line of best fit.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q254) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/13y-6elTP9NjK5KVKYW0haI2KGmWqcvu0/view?usp=share\_link**](https://drive.google.com/file/d/13y-6elTP9NjK5KVKYW0haI2KGmWqcvu0/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is a measure of the goodness of fit of a linear regression model?**

a) The standard deviation of the residuals

b) The sum of the squared residuals

c) The F-test

d) All of the above

Correct Answer: Option (d)

Explanation: The goodness of fit of a linear regression model can be assessed using several measures, including the standard deviation of the residuals, the sum of the squared residuals, and the F-test. The standard deviation of the residuals represents the average distance between the observed values of the dependent variable and the predicted values of the dependent variable. The sum of the squared residuals represents the total amount of error in the model. The F-test is used to test whether the model as a whole is statistically significant.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q255) Which of the following is a condition that must be satisfied for a linear regression model to be valid?**

a) The residuals must be normally distributed.

b) The independent variable must be normally distributed.

c) The dependent variable must be normally distributed.

d) The residuals must be linearly related to the dependent variable.

Correct Answer: Option (a)

Explanation: One of the conditions that must be satisfied for a linear regression model to be valid is that the residuals (the differences between the observed values and the predicted values) must be normally distributed. The other options (b), (c), and (d) are incorrect because they do not represent conditions for the validity of the linear regression model.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q256) Which of the following is not a requirement for the least-squares regression line?**

a) Line passes through the mean of both variables

b) Residuals have a mean of zero

c) Residuals have equal variances for all values of x

d) Line passes through the origin

Correct Answer: Option (d)

Explanation: The least-squares regression line is a line that minimizes the sum of the squared residuals between the observed values and the predicted values. There are several requirements for the least-squares regression line, which include the line passing through the mean of both variables (option a), residuals having a mean of zero (option b), and residuals having equal variances for all values of x (option c). However, the line does not necessarily have to pass through the origin, as it may have a non-zero y-intercept.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q257) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1safjVg-IclSOqwqKiOlD2jJPHaWluxw2/view?usp=share\_link**](https://drive.google.com/file/d/1safjVg-IclSOqwqKiOlD2jJPHaWluxw2/view?usp=share_link) **)**

**TYPE: Audio**

**The coefficient of determination () is:**

a) The proportion of the variation in the dependent variable that is explained by the independent variable

b) The proportion of the variation in the independent variable that is explained by the dependent variable

c) The slope of the least-squares regression line

d) The intercept of the least-squares regression line

Correct Answer: Option (a)

Explanation: The coefficient of determination () is a measure of how well the least-squares regression line fits the data. It represents the proportion of the variation in the dependent variable (y) that is explained by the independent variable (x). R² ranges from 0 to 1, with higher values indicating a better fit. Option (b) is incorrect because it describes the coefficient of correlation (r), which measures the strength and direction of the linear relationship between two variables. Options (c) and (d) are incorrect because they describe the slope and intercept of the least-squares regression line, respectively.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q258) A company sells two products, A and B. The regression equation for the sales of A and B are yA = 2x + 5 and yB = 3x - 4, respectively, where x represents the advertising expenditure in thousands of dollars and y represents the sales in thousands of dollars. If the company spends $10,000 on advertising for each product, what is the predicted total sales for the two products?**

a) $44,000

b) $50,000

c) $56,000

d) $62,000

Correct Answer: Option (c)

Explanation: To find the predicted total sales for the two products, we need to calculate the sales for each product using the given regression equations and then add them together.

For product A:

When x = 10 (i.e., $10,000 spent on advertising),

For product B:

When ,

Total predicted sales =

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q259) Which of the following is a correct interpretation of the slope of the least-squares regression line?**

a) The change in the dependent variable for a one-unit increase in the independent variable

b) The change in the independent variable for a one-unit increase in the dependent variable

c) The proportion of the variation in the dependent variable that is explained by the independent variable

d) The proportion of the variation in the independent variable that is explained by the dependent variable

Correct Answer: Option (a)

Explanation: The slope of the least-squares regression line represents the change in the dependent variable (y) for a one-unit increase in the independent variable (x). In other words, it gives the rate of change of the dependent variable as the independent variable increases. Option (b) is incorrect because it describes the reciprocal of the slope, which is the change in the independent variable for a one-unit increase in the dependent variable. Options (c) and (d) are incorrect because they describe the coefficient of determination () and do not relate to the slope of the line.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q260) The residual plot is used to:**

a) Check the linearity assumption of the least-squares regression model

b) Check the normality assumption of the least-squares regression model

c) Check for outliers and influential points in the data

d) Check the homoscedasticity assumption of the least-squares regression model

Correct Answer: Option (c)

Explanation: The residual plot is a graph of the residuals (the differences between the observed values and the predicted values) against the independent variable. It is used to identify outliers and influential points in the data, which may affect the fit of the least-squares regression line. Option (a) describes the linearity assumption, which can be checked by examining the scatterplot of the data. Option (b) describes the normality assumption, which can be checked by examining the histogram or normal probability plot of the residuals. Option (d) describes the homoscedasticity assumption, which can be checked by examining the plot of the residuals against the predicted values.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Remember

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**Q261) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1WPAqUvyNMsiVwwDpkCMfbIocB0oX4b7S/view?usp=share\_link**](https://drive.google.com/file/d/1WPAqUvyNMsiVwwDpkCMfbIocB0oX4b7S/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following statements about the least-squares regression line is true?**

a) The line always passes through at least one data point

b) The line always passes through the mean of both variables

c) The line always has a slope of 1

d) The line always has the smallest sum of squared residuals

Correct Answer: Option (d)

Explanation: The least-squares regression line is a line that minimizes the sum of the squared residuals between the observed values and the predicted values. This means that it has the smallest sum of squared residuals among all possible lines. Option (a) is incorrect because the line may not pass through any of the data points. Option (b) is incorrect because the line only passes through the mean of both variables if the correlation between the variables is 1. Option (c) is incorrect because the slope of the line is determined by the relationship between the variables and may not be equal to 1.

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q262) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1o26c1Zmxoy5Cpe3qFtprsn9-T9dDJ0S5/view?usp=share\_link**](https://drive.google.com/file/d/1o26c1Zmxoy5Cpe3qFtprsn9-T9dDJ0S5/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following assumptions is NOT required for the least-squares regression model?**

a) Linearity of the relationship between the variables

b) Normality of the residuals

c) Homoscedasticity of the residuals

d) Independence of the observations

Correct Answer: Option (b)

Explanation: The least-squares regression model assumes that the relationship between the variables is linear, the residuals have constant variance (homoscedasticity), and the observations are independent. However, the normality of the residuals is not required for the model to be valid. While it is often desirable for the residuals to be approximately normally distributed, violations of this assumption do not necessarily invalidate the model.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q263) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1lIYrgqLlE9fDI44EomZCkrxPpTrIVXl2/view?usp=share\_link**](https://drive.google.com/file/d/1lIYrgqLlE9fDI44EomZCkrxPpTrIVXl2/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is the appropriate test to use to determine if there is a significant linear relationship between two variables?**

a) Two-sample t-test

b) Paired t-test

c) Analysis of variance (ANOVA)

d) Pearson correlation coefficient

Correct Answer: Option (d)

Explanation: The Pearson correlation coefficient is a measure of the strength and direction of the linear relationship between two variables. It ranges from -1 (perfect negative correlation) to +1 (perfect positive correlation), with 0 indicating no linear relationship. To determine if there is a significant linear relationship between the variables, a hypothesis test can be conducted using the Pearson correlation coefficient. The appropriate test is a t-test with n-2 degrees of freedom, where n is the sample size.

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q264) Answer the following question with reference to the audio**

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**TYPE: Audio**

**In multiple linear regression, the adjusted coefficient of determination:**

a) Is always smaller than the coefficient of determination

b) Is always larger than the coefficient of determination

c) Accounts for the number of independent variables in the model

d) Is the same as the coefficient of multiple determination

Correct Answer: Option (c)

Explanation: The adjusted coefficient of determination (R²adj) is a modified version of the coefficient of determination (R²) that accounts for the number of independent variables in the model. While the coefficient of determination increases as more independent variables are added to the model, the adjusted coefficient of determination takes into account the number of variables and penalizes the addition of unnecessary variables. Thus, the adjusted coefficient of determination is always smaller than the coefficient of determination. Option (a) is incorrect because the adjusted coefficient of determination can be larger than the coefficient of determination if adding a variable improves the model significantly. Option (b) is incorrect because it is the opposite of the correct answer. Option (d) is incorrect because the coefficient of multiple determination is a term used in the context of multiple correlation, not multiple regression.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q265) Answer the following question with reference to the audio**

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**TYPE: Audio**

**Which of the following is NOT a common method for detecting outliers in a linear regression model?**

a) Residual plot

b) Cook's distance

c) Mahalanobis distance

d) Studentized residual

Correct Answer: Option (c)

Explanation: The Mahalanobis distance is a measure of the distance between a data point and the center of a distribution, and is not a common method for detecting outliers in a linear regression model. The residual plot, Cook's distance, and studentized residual are all commonly used methods for detecting outliers in a linear regression model. The residual plot involves plotting the residuals against the predicted values and looking for patterns or outliers. Cook's distance is a measure of the influence of each observation on the fitted values and can be used to identify influential observations. Studentized residual is a measure of the deviation of the residual for an observation from what would be expected based on the other observations in the model.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q266) Answer the following question with reference to the audio**

**(** [**https://drive.google.com/file/d/1PEG-vuvu2uY4Kfes6DMCh5ypBoc6OQEm/view?usp=share\_link**](https://drive.google.com/file/d/1PEG-vuvu2uY4Kfes6DMCh5ypBoc6OQEm/view?usp=share_link) **)**

**TYPE: Audio**

**Which of the following is a limitation of the least-squares regression model?**

a) It can handle only linear relationships between variables

b) It is sensitive to outliers in the data

c) It cannot handle more than one independent variable

d) It requires the dependent variable to be normally distributed

Correct Answer: Option (a)

Explanation: The least-squares regression model can handle only linear relationships between variables, which is a limitation when the relationship between the variables is nonlinear. Nonlinear relationships can be transformed to a linear form, but this can be difficult or impossible in some cases. Option (b) is incorrect because the model can be robust to outliers if appropriate diagnostic tools are used. Option (c) is incorrect because the model can handle more than one independent variable, as long as they are not highly correlated. Option (d) is incorrect because the normality assumption applies to the residuals, not the dependent variable.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q267) Which of the following is NOT a characteristic of a good linear regression model?**

a) High coefficient of determination (R²)

b) Low p-values for the coefficients

c) Low standard error of the estimate

d) High correlation coefficient (r)

Correct Answer: Option (d)

Explanation: A high correlation coefficient (r) is not necessarily a characteristic of a good linear regression model. The correlation coefficient measures only the strength and direction of the linear relationship between two variables, and does not take into account the other characteristics of the model. A good linear regression model should have a high coefficient of determination (R²), indicating a high proportion of the variation in the dependent variable is explained by the independent variables, low p-values for the coefficients, indicating that the independent variables are significantly related to the dependent variable, and a low standard error of the estimate, indicating that the predicted values are close to the actual values.

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q268) Suppose there are n observations and x̄ and ȳ are the sample means of the x and y variables, respectively. Which of the following expressions represents the correlation coefficient between x and y?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: The correlation coefficient r between x and y is given by the formula:

where xi and yi are the ith observations, and x̄ and y ̄ are the sample means of the x and y variables, respectively.

Expanding the numerator of the formula gives:

Substituting this into the original formula gives:

Simplifying the denominator using the standard deviation formula gives:

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q269) Consider the regression equation , where a and b are constants. If the value of b is positive, then which of the following statements is true?**

a) As x increases, y decreases

b) As x increases, y increases

c) As x increases, y first increases and then decreases

d) As x increases, y first decreases and then increases

Correct Answer: Option (b)

Explanation: The slope of the regression line is given by b, which represents the change in y for every unit increase in x. Since b is positive, this means that as x increases, y also increases.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q270) Consider the following linear regression equation: . Which of the following statements is true?**

a) The slope of the regression line is 3.

b) The y-intercept of the regression line is 2.

c) For every one unit increase in x, there is a two unit increase in y.

d) The coefficient of determination for this regression is 2.

Correct Answer: Option (c)

Explanation: The given linear regression equation is y = 2x + 3, which means that the slope of the regression line is 2 and the y-intercept is 3. Option (a) is incorrect because the slope is not 3. Option (b) is incorrect because the y-intercept is not 2. Option (d) is incorrect because the coefficient of determination is a measure of the proportion of the total variation in y that can be explained by the regression model, and its value can range from 0 to 1. The correct statement is given in option (c): for every one unit increase in x, there is a two unit increase in y. This is because the slope of the regression line is 2, which means that the change in y is twice the change in x.

Thus, the correct answer is option (c).

Difficulty Level- Very Hard

Bloom’s Taxonomy- Understand

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**Q271) In linear programming, what is the objective function?**

a) A constraint in the problem

b) A linear equation that represents the quantity to be maximized or minimized

c) A variable in the problem

d) An inequality in the problem

Correct Answer: Option (b)

Explanation: The objective function in linear programming is a linear equation that represents the quantity to be maximized or minimized. It is typically of the form , where a, b, c, ... are constants, and x, y, z, ... are the decision variables.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q272) Which of the following is a requirement for a problem to be a linear programming problem?**

a) The objective function must be nonlinear

b) The decision variables must be continuous

c) The constraints must be nonlinear

d) The problem must have at least one constraint

Correct Answer: Option (b)

Explanation: One of the requirements for a problem to be a linear programming problem is that the decision variables must be continuous. This means that they can take on any value within a certain range, rather than being restricted to specific values or intervals.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q273) In linear programming, what is a feasible solution?**

a) A solution that satisfies all of the constraints in the problem

b) A solution that maximizes or minimizes the objective function

c) A solution that violates one or more of the constraints in the problem

d) A solution that is not optimal

Correct Answer: Option (a)

Explanation: A feasible solution in linear programming is a solution that satisfies all of the constraints in the problem. It may or may not be optimal (i.e., it may or may not maximize or minimize the objective function), but it is a valid solution that meets all of the problem's requirements.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q274) What is the graphical method used in linear programming?**

a) To obtain a feasible solution

b) To obtain the optimal solution

c) To obtain the feasible region

d) To obtain the slack variables

Correct Answer: Option (c)

Explanation: The graphical method in linear programming is used to find the feasible region of the problem. The feasible region is the set of all possible solutions that satisfy the constraints of the problem. Once the feasible region has been identified, the optimal solution can be found by evaluating the objective function at each corner point of the feasible region.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q275) Which of the following is a condition for a linear programming problem to have a unique optimal solution?**

a) The feasible region is unbounded

b) The objective function is nonlinear

c) The feasible region is a convex polygon

d) The constraints are not all inequalities

Correct Answer: Option (c)

Explanation: For a linear programming problem to have a unique optimal solution, the feasible region must be a convex polygon. A convex polygon is a region that does not have any indentations or concave sections. If the feasible region is not a convex polygon, then the problem may have multiple optimal solutions or no optimal solution at all.

Thus, the correct answer is option (c).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q276) What is the purpose of the simplex method in linear programming?**

a) To find the feasible region

b) To find the optimal solution

c) To graph the constraints

d) To evaluate the objective function

Correct Answer: Option (b)

Explanation: The simplex method is used to find the optimal solution of a linear programming problem. It does this by starting at a corner point of the feasible region and then moving along the edges of the feasible region until it reaches the optimal solution. At each step, the simplex method evaluates the objective function to determine which direction to move in. The process continues until the optimal solution is reached.

Thus, the correct answer is option (b).

Difficulty Level- Easy

Bloom’s Taxonomy- Understand

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**Q277) Which of the following is NOT a limitation of Linear Programming?**

a) Non-linear relationships cannot be modeled

b) The constraints must be expressed in terms of linear inequalities

c) It can only be used to maximize or minimize a linear objective function

d) It can solve problems with an infinite number of feasible solutions

Correct Answer: Option (d)

Explanation: Linear Programming has several limitations, including the requirement that constraints be expressed as linear inequalities and the inability to model non-linear relationships. However, it is not limited to problems with a finite number of feasible solutions, and can in fact be used to solve problems with an infinite number of feasible solutions.

Thus, the correct answer is option (d).

Difficulty Level- Easy

Bloom’s Taxonomy- Analyze

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**Q278) In Linear Programming, what is the feasible region?**

a) The set of all points that satisfy the constraints

b) The set of all points that do not satisfy the constraints

c) The point that maximizes the objective function

d) The point that minimizes the objective function

Correct Answer: Option (a)

Explanation: The feasible region in Linear Programming is the set of all points that satisfy the constraints. The objective function is then optimized within this feasible region to find the optimal solution.

Thus, the correct answer is option (a).

Difficulty Level- Easy

Bloom’s Taxonomy- Undersand

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**Q279) What is the difference between a feasible solution and an optimal solution in Linear Programming?**

a) Feasible solutions satisfy the constraints, while optimal solutions maximize the objective function

b) Feasible solutions maximize the objective function, while optimal solutions satisfy the constraints

c) Feasible solutions do not satisfy the constraints, while optimal solutions do

d) Feasible solutions and optimal solutions are the same thing

Correct Answer: Option (a)

Explanation: A feasible solution in Linear Programming satisfies all the constraints, while an optimal solution is a feasible solution that maximizes or minimizes the objective function. Therefore, feasible solutions may not necessarily be optimal solutions, as there may be other feasible solutions that result in a better objective function value.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q280) What is the feasible region in linear programming?**

a) The region of intersection of all constraint lines

b) The set of all possible solutions to the objective function

c) The set of all optimal solutions to the objective function

d) The region above the objective function line

Correct Answer: Option (a)

Explanation: The feasible region in linear programming is the region of intersection of all the constraint lines. This region represents all possible combinations of values of decision variables that satisfy all the constraints.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q281) In linear programming, what is the purpose of the simplex method?**

a) To determine the feasible region

b) To determine the optimal solution

c) To solve for the objective function

d) To graph the constraint lines

Correct Answer: Option (b)

Explanation: The simplex method is a popular algorithm used in linear programming to find the optimal solution to the objective function. The method involves moving from one basic feasible solution to another until the optimal solution is found.

Thus, the correct answer is option (b).

Difficulty Level- Medium

Bloom’s Taxonomy- Understand

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**Q282) What is the difference between a feasible solution and an optimal solution in linear programming?**

a) A feasible solution satisfies all constraints, while an optimal solution maximizes the objective function

b) A feasible solution maximizes the objective function, while an optimal solution satisfies all constraints

c) A feasible solution is unbounded, while an optimal solution is bounded

d) A feasible solution is infeasible, while an optimal solution is feasible

Correct Answer: Option (a)

Explanation: A feasible solution in linear programming satisfies all the constraints, while an optimal solution maximizes the objective function within the feasible region. In other words, an optimal solution is a feasible solution that yields the best possible value for the objective function.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**283) In linear programming, which of the following methods can be used to determine the feasible region?**

a) Graphing

b) Matrix multiplication

c) Gaussian elimination

d) Inverse matrix

Correct Answer: Option (a)

Explanation: In linear programming, the feasible region is the set of all possible solutions to the system of constraints. One common method for determining the feasible region is to graph the constraints in the coordinate plane and shade the region that satisfies all of the constraints.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q284) Which of the following is not a characteristic of the optimal solution to a linear programming problem?**

a) The objective function is maximized or minimized.

b) All constraints are satisfied.

c) The feasible region is convex.

d) It lies on the boundary of the feasible region.

Correct Answer: Option (d)

Explanation: The optimal solution to a linear programming problem is the solution that maximizes or minimizes the objective function while satisfying all of the constraints. The feasible region is a convex set, which means that any two points in the feasible region can be connected by a line that lies entirely within the feasible region. However, the optimal solution does not have to lie on the boundary of the feasible region. It can also lie in the interior of the feasible region.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q285) Which of the following is true for an unbounded feasible region in linear programming?**

a) The optimal solution exists.

b) The optimal solution does not exist.

c) The objective function is unbounded.

d) The feasible region is empty.

Correct Answer: Option (c)

Explanation: An unbounded feasible region in linear programming is a region that extends infinitely in one or more directions. In this case, the objective function may not have a maximum or minimum value. For example, if the objective function is to maximize profits, an unbounded feasible region could represent a situation where profits can be increased indefinitely without limit.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q286) A company produces two types of products, A and B. The profit per unit of A is Rs. 5 and that of B is Rs. 3. Each unit of A requires 3 hours of production time and each unit of B requires 2 hours of production time. The company has a maximum of 240 hours of production time per day. If x and y are the number of units of A and B produced, respectively, then which of the following is the objective function of the given problem?**

a)

b)

c)

d)

Correct Answer: Option (a)

Explanation: Since the profit per unit of A is Rs. 5 and that of B is Rs. 3, the objective function of the problem is given by , where x and y are the number of units of A and B produced, respectively.

Thus, the correct answer is option (a).

Difficulty Level- Medium

Bloom’s Taxonomy- Evaluate

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**Q287) Which of the following statements about the feasible region is true?**

a) The feasible region is always a closed and bounded region.

b) The feasible region is always an open and unbounded region.

c) The feasible region may be a closed and bounded region or an open and unbounded region.

d) The feasible region is always a closed region but may or may not be bounded.

Correct Answer: Option (c)

Explanation: The feasible region of a linear programming problem is the set of points satisfying the constraints of the problem. It may be a closed and bounded region or an open and unbounded region, depending on the constraints of the problem.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q288) Which of the following statements about the simplex method is true?**

a) The simplex method can be used only for linear programming problems with two decision variables.

b) The simplex method can be used only for linear programming problems with three or more decision variables.

c) The simplex method can be used for linear programming problems with any number of decision variables.

d) The simplex method can be used only for linear programming problems with integer decision variables.

Correct Answer: Option (c)

Explanation: The simplex method can be used for linear programming problems with any number of decision variables. It is a popular method for solving linear programming problems because it is simple and efficient.

Thus, the correct answer is option (c).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q289) In linear programming, which of the following statements is true regarding the feasible region?**

a) The feasible region may be empty.

b) The feasible region must always contain the origin.

c) The feasible region is always a closed region.

d) The feasible region is always a convex region.

Correct Answer: Option (d)

Explanation: The feasible region in linear programming is the set of all possible solutions that satisfy the constraints of the problem. This region is defined by a set of linear inequalities or equations. Since a linear programming problem always involves linear functions, the feasible region is always a convex region.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q290) Which of the following is a graphical method used to solve linear programming problems?**

a) Simplex method

b) Transportation method

c) Dual simplex method

d) Corner-point method

Correct Answer: Option (d)

Explanation: The corner-point method is a graphical method used to solve linear programming problems. It involves drawing the feasible region on a coordinate plane and finding the corner points of the region. These corner points are then evaluated to find the optimal solution to the problem.

Thus, the correct answer is option (d).

Difficulty Level- Medium

Bloom’s Taxonomy- Analyze

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**Q291) Which of the following statements is true regarding the dual problem in linear programming?**

a) The dual problem is always a maximization problem.

b) The dual problem is always a minimization problem.

c) The objective function in the dual problem is the same as the objective function in the original problem.

d) The dual problem can only be solved using the simplex method.

Correct Answer: Option (c)

Explanation: The dual problem in linear programming is a related problem that can be used to find the optimal solution of the original problem. The dual problem involves interchanging the roles of the constraints and variables of the original problem. The objective function in the dual problem is always the opposite of the objective function in the original problem.

Thus, the correct answer is option (d).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q292) In linear programming, if the objective function is to be maximized, then the feasible region is:**

a) Bounded

b) Unbounded

c) Empty

d) None of the above

Correct Answer: Option (b)

Explanation: In linear programming, if the objective function is to be maximized, then the feasible region is unbounded. This is because an unbounded feasible region allows for the objective function to increase without limit. On the other hand, if the objective function is to be minimized, then the feasible region must be bounded, as there is a minimum value for the objective function.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q293) In a linear programming problem, if the optimal solution lies at an extreme point of the feasible region, then the solution is:**

a) Unique

b) Non-unique

c) Infeasible

d) None of the above

Correct Answer: Option (a)

Explanation: In a linear programming problem, if the optimal solution lies at an extreme point of the feasible region, then the solution is unique. This is known as the corner-point theorem, which states that the optimal solution to a linear programming problem lies at one of the extreme points of the feasible region. If the optimal solution does not lie at an extreme point, then it is either non-unique or infeasible.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q294) In a linear programming problem, if the objective function coefficients change, then the optimal solution:**

a) Remains the same

b) Changes in a predictable way

c) May change unpredictably

d) None of the above

Correct Answer: Option (c)

Explanation: In a linear programming problem, if the objective function coefficients change, then the optimal solution may change unpredictably. This is because a change in the coefficients can cause the position of the optimal solution to shift or move to a different extreme point. Therefore, the optimal solution is not necessarily stable when the coefficients are changed.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q295) Which of the following statements is true regarding the graphical solution method for linear programming?**

a) The feasible region is always a closed and bounded region.

b) An unbounded feasible region means that the problem has no solution.

c) The optimal solution can only occur at a corner point of the feasible region.

d) A constraint that is not binding can be ignored in the graphical solution method.

Correct Answer: Option (c)

Explanation: The graphical solution method involves graphing the constraints and finding the feasible region, which is the region that satisfies all the constraints. The optimal solution is the point in the feasible region that maximizes or minimizes the objective function. The optimal solution can only occur at a corner point (also called a vertex) of the feasible region, because the objective function can only increase or decrease as we move from one corner point to another. Options A and B are not always true. The feasible region can be unbounded if one or more of the constraints have no upper or lower bound. An unbounded feasible region does not mean that the problem has no solution; it means that the solution is infinite. Option D is not true, because even a non-binding constraint affects the shape and size of the feasible region.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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**Q296) Which of the following is not a requirement for a linear programming problem to have an optimal solution?**

a) The feasible region must be non-empty.

b) The objective function must be linear.

c) The feasible region must be bounded.

d) The constraints must be linear.

Correct Answer: Option (a)

Explanation: A linear programming problem is a mathematical optimization problem where we seek to maximize or minimize a linear objective function subject to linear constraints. To have an optimal solution, the problem must satisfy certain requirements. The objective function and constraints must be linear, which eliminates options B and D. The feasible region must be a closed and bounded region, which eliminates option C. However, the feasible region does not need to be non-empty for the problem to have an optimal solution. If the feasible region is empty, it means that there is no solution that satisfies all the constraints.

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q297) In a linear programming problem, if the feasible region is unbounded, then:**

a) The problem has an optimal solution

b) The problem has multiple optimal solutions

c) The problem does not have an optimal solution

d) None of the above

Correct Answer: Option (c)

Explanation: If the feasible region is unbounded, then the linear programming problem does not have an optimal solution. This is because the objective function can be made arbitrarily large by choosing a point in the direction of an unbounded ray.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q298) Which of the following statements about the dual of a linear programming problem is true?**

a) The objective function of the dual problem is always maximization

b) The number of constraints in the dual problem is equal to the number of decision variables in the original problem

c) The feasible region of the dual problem is always nonempty and bounded

d) None of the above

Correct Answer: Option (b)

Explanation: The number of constraints in the dual problem is equal to the number of decision variables in the original problem. The objective function of the dual problem is always minimization, and the feasible region of the dual problem is not necessarily nonempty and bounded.

Thus, the correct answer is option (b).

Difficulty Level- Hard

Bloom’s Taxonomy- Analyze

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**Q299) A company manufactures two products, X and Y. The profit per unit of X and Y is Rs. 20 and Rs. 30 respectively. The production time per unit of X and Y is 3 and 4 hours respectively. The company has a total of 60 hours of production time available. If the company wants to maximize its profit, then which of the following linear programming models represents the problem?**

a) Maximize subject to

b) Maximize subject to 3

c) Maximize subject to

d) Maximize subject to

Correct Answer: Option (a)

Explanation: The objective is to maximize profit, which is given by . The constraint is the available production time, which is given by . Since X takes 3 hours to produce and Y takes 4 hours to produce, the constraint equation is Therefore, the correct linear programming model is Maximize subject to .

Thus, the correct answer is option (a).

Difficulty Level- Hard

Bloom’s Taxonomy- Evaluate

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**Q300) Consider the linear programming problem of maximizing the objective function subject to the constraints and , where is an matrix, b is an vector, and c is an vector. Let be a basic feasible solution. Then, which of the following is true?**

a) is the unique optimal solution

b) is not an optimal solution

c) is a degenerate optimal solution

d) is not a basic feasible solution

Correct Answer: Option (c)

Explanation: If is a basic feasible solution, then it corresponds to a basic feasible solution of the corresponding system of equations . If is also optimal, then it is a degenerate optimal solution, i.e., there exists at least one other optimal solution that is not a basic feasible solution.

Thus, the correct answer is option (c).

Difficulty Level- Hard

Bloom’s Taxonomy- Understand

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