KATTAR NEET 2026

Physics By Manish Raj Sir

Basic Maths and Calculus (Mathematical Tools)

Q1 Differentiate the given function (y) with respect to *x, where* $y = \frac{x}{\sin x}$

(A) $\frac{\cos x - x \ \sin x}{\sin^2 x}$

(B) $\frac{\sin x - x \ \cos x}{\sin^2 x}$

(C) $\frac{\tan x - x \ \sin x}{\cos^2 x}$

(D) $\frac{\cos x + x \ \sin x}{\cos^2 x}$

Q2 Find $\int (6x+2)^3 dx$

(A) $\frac{(6x+2)^4}{24} + \text{constant}$

(B) $\frac{(6x+2)^4}{12} + \text{constant}$

(C) $\frac{(3x+2)^4}{24} + \text{constant}$

(D) $\frac{(3x+2)^4}{12} + \text{constant}$

Q3 Find maximum or minimum values of the function $y = 25x^2 + 5 - 10x$

(A) 2 (B) 3

(C) 4 (D) 5

Q4 Find the value of sin 240°

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{\sqrt{3}}{2}$

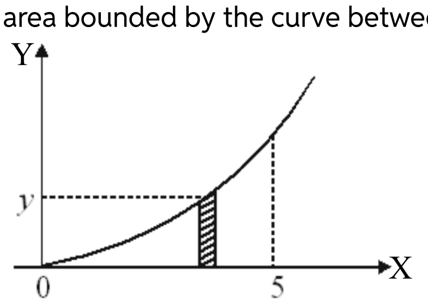
(C) $-\frac{\sqrt{3}}{2}$ (D) $-\frac{1}{2}$

Q5 Find the value of 2 sin 45° cos 15°

(A) 1 (B) 0

(C) $\left(\frac{\sqrt{3}+1}{2}\right)$ (D) $\left(\frac{\sqrt{3}-1}{2}\right)$

Q6 Figure shows the parabolic curve $y = 2x^2$. Find the area bounded by the curve between 0 and 5.



(A) $\frac{220}{3}$ unit (B) $\frac{230}{3}$ unit

(C) $\frac{250}{3}$ unit (D) $\frac{260}{3}$ unit

Q7 Divide the number 10 into two parts, so that their product is maximum. Out of the two parts, one part will be

(A) 3 (B) 4

(C) 5 (D) 8

Q8 The acceleration due to gravity at a height h above the Earth's surface is $g' = gR^2 / (R+h)^2$, where R is the Earth's radius. If h << R, g' can be approximated as:

(A) $g\left(1 - \frac{h}{R}\right)$ (B) $g\left(1 - \frac{2h}{R}\right)$

(C) $g\left(1 + \frac{2h}{R}\right)$ (D) $2g\left(1 - \frac{h}{R}\right)$

Q9 The potential energy of a particle in a force field is $U = A/r^2 - B/r$, where A and B are positive constants and r is the distance from the center of the field. The value of r for which the particle is in equilibrium (F= 0) is:

(A) B/A (B) A/B

(C) 2A/B (D) B/2A

Q10 Given below are two statements:

Statement I: The definite integral $\int_a^b$ f(x) dx geometrically represents the algebraic sum of areas bounded by y=f(x), x-axis and ordinates x=a, x=b.

Statement II: Integration is the reverse process of differentiation.

In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Statement-I is True, Statement-II is True; Statement-II is a correct explanation for Statement-I.

(B) Statement-I is True, Statement-II is True; Statement-II is NOT a correct explanation for Statement-I.

(C) Statement-I is True, Statement-II is False.

(D) Statement-I is False, Statement-II is True.

Q11 Consider the following statements regarding maxima and minima:

Statement 1: If f'(c) = 0 and f"(c) > 0, then f(x) has a local minimum at x = c.

Statement 2: A function can have a local maxima or minima at a point, where its derivative does not exist.

Statement 3: For a particle, whose motion is described by x(t), if its velocity v(t) = 0 at time t = 0, then its acceleration a(t) must also be zero.

(A) Statement 1 is True, Statement 2 is True, Statement 3 is False

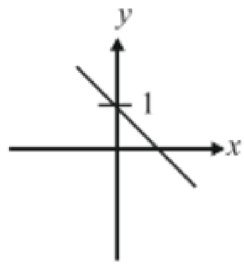
(B) Statement 1 is True, Statement 2 is False, Statement 3 is True

(C) Statement 1 is False, Statement 2 is True, Statement 3 is False

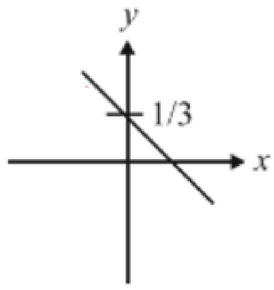
(D) All statements are True

Q12 Correct graph of $3x - 3y - 1 = 0$ is;

(A)



(B)



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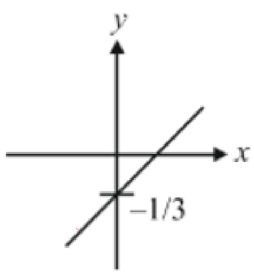
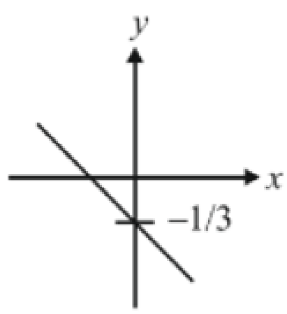


(D)



Q13 $\frac{d}{dx}\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2$ is equal to;

(A) $1 + \frac{1}{x^2}$ (B) $-1 + \frac{1}{x^2}$

(C) $1 - \frac{1}{x^2}$ (D) $x^2 - 1$

Q14 Given $x^2 + 7x + 12 = 0$, find the roots of x.

(A) $x = \frac{3}{2}, -4$

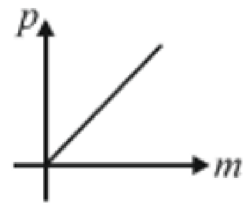
(B) $x = -3, -4$

(C) $x = \frac{3}{2}, 4$

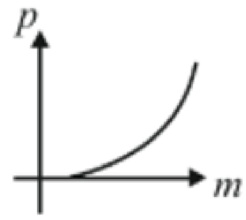
(D) $x = \frac{3}{2}, -2$

Q15 Draw graph between momentum (p) and mass (m) of the object. Where *E* is kinetic energy and it is constant (given $E = \frac{p^2}{2m}$)

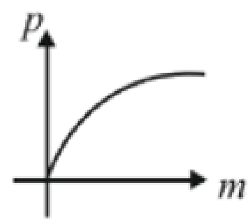
(A)



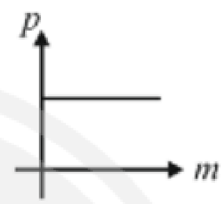
(B)



(C)



(D)



Q16 Using binomial approximation, $(1.002)^{10}$ is approximately equal to:

(A) 1.000 (B) 1.020

(C) 1.040 (D) 1.060

Q17 The slope of the tangent to the curve $y = x^3 - 3x + 2$ at the point where the curve cuts the y-axis is:

(A) -3 (B) 0

(C) 2 (D) 3

Q18 For a simple pendulum, the restoring force is F = −mg sinθ. If θ is small, and the horizontal displacement is $x \approx L\theta$ (where L is length), the force can be approximated as proportional to x with a constant of proportionality $\frac{mg}{L}$.

(A) -mg/L (B) -mgL

(C) -g/L (D) -mg

Q19 The integral $\int (1/(2\sqrt{x}) + 2\cos(2x))dx$ is;

(A) $\sqrt{x} + \sin(2x) + C$

(B) $2\sqrt{x} + \sin(2x) + C$

(C) $\sqrt{x} + 2\sin(2x) + C$

(D) $\ln(\sqrt{x}) + \sin(2x) + C$

Q20 The average value of velocity $v(t) = (3t^2 - 2t)$ m/s over the time interval t = 0 to t = 2s is:

(A) 1 m/s (B) 2 m/s

(C) 3 m/s (D) 4 m/s

Q21 If α and β are the roots of the quadratic equation $x^2 - 6x + 4 = 0$, then the value of $\alpha^2 + \beta^2$ is:

(A) 20 (B) 28
(C) 36 (D) 44

Q22 If $\log_e(x+5)-\log_e(x)=\log_e 3$, then the value of x is;
(A) $\frac{2}{3}$
(B) $\frac{3}{2}$
(C) $\frac{2}{5}$
(D) $\frac{5}{2}$

Q23 Simplify: $\log_2 8+\log_2 2+\log_2 (4)^2$.
(A) 5 (B) 6
(C) 4 (D) 8

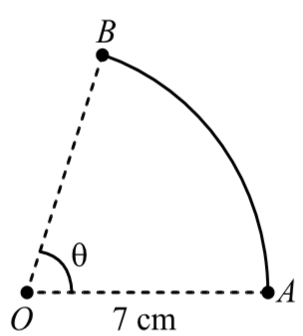
Q24 If $Y=\left(\frac{1}{(n-1)^2}-\frac{1}{n^2}\right)$ where n >>> 1, then the value of Y after simplification will be:
(A) 1 (B) ∞
(C) $4/n^3$ (D) $2/n^3$

Q25 Use binomial approximation to find out approximate value of $\sqrt{99}$?
(A) 9.89 (B) 9.95
(C) 9.99 (D) 9.50

Q26 For the straight-line $y = 2x + 3$, the x intercept is:
(A) 3 (B) –3
(C) $-\frac{3}{2}$ (D) $\frac{3}{2}$

Q27 The value of 2 sin75° cos75° after simplification is:
(A) 1 (B) 2
(C) $\frac{3}{4}$ (D) $\frac{1}{2}$

Q28 A circular arc AB of radius 7 cm has an arc length of π cm. The angle θ subtended by the arc at the centre is:



(A) $\left(\frac{\pi}{7}\right)^{o}$
(B) $\left(\frac{7}{\pi}\right)^{o}$
(C) $\frac{\pi}{7}\,\text{rad}$
(D) $\frac{7}{\pi}\text{rad}$

Q29 What is the sum of the roots of the quadratic equation $2x^2 - x - 3 = 0$?
(A) 1 (B) $\frac{1}{2}$
(C) 2 (D) $-\frac{1}{2}$

Q30 Find $\frac{d}{dx}\left(\frac{1}{\sqrt[4]{x^3}}\right)$
(A) $\frac{1}{4}x^{-7/4}$ (B) $\frac{-3}{4}x^{-10/4}$
(C) $\frac{-1}{4}x^{1/4}$ (D) $\frac{-3}{4}x^{-7/4}$

Q31 Which of the following graph is/are straight line for the equation $y^2 = 2x$?
I. Graph: y versus x^2
II. Graph = y^2 versus x
III. Graph: y versus $\sqrt{x}$
IV. Graph: $\sqrt{y}$ versus x
(A) I, IV (B) II, III
(C) I, III (D) Only II

Q32 The value of cos 150° is:
(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$
(C) $-\frac{\sqrt{3}}{2}$ (D) $\frac{\sqrt{3}}{2}$

Q33 Differentiate: $y=e^x+\sqrt{x}+1$ with respect to x.
(A) $e^x+\frac{1}{2\sqrt{x}}$ (B) $e^x+\frac{1}{2\sqrt{x}}+1$
(C) $e^x-\frac{1}{2\sqrt{x}}$ (D) $e^x-\frac{1}{2\sqrt{x}}+1$

Q34 The area under the curve $y=x^2+a$ (a is constant) and x axis from $x = 0$ to $x = 2$ is $\frac{11}{3}$ units, then the value of a is:
(A) $\frac{1}{2}$ (B) 2
(C) $-\frac{1}{2}$ (D) 1

Q35 The maximum value of $y = 4\sin\theta - 4\cos\theta$ is:
(A) $4\sqrt{2}$ (B) 4
(C) 2 (D) 5

Q36 Choose correct expression for $\frac{dy}{dx}$ where $y=\frac{2x+5}{3x-2}$
(A) $\frac{-19}{(3x-2)^2}$
(B) $\frac{19}{(3x-2)}$
(C) $\frac{-19}{(3x+2)}$
(D) $\frac{-19}{(3x+2)^2}$

Q37 Which of the following relations are **correct**?
A. $\sin(A-B) = \sin A\cos B - \cos A\sin B$
B. $\cos 2A = \cos^2 A - \sin^2 A$
C. $\cos(A+B) = \cos A\cos B + \sin A\sin B$
(A) A, B only (B) B, C only
(C) A, C only (D) A, B, C

Q38 The derivative of $y=\sin(\sqrt{x})$ with respect to x is:
(A) $\frac{\cos(\sqrt{x})}{2\sqrt{x}}$
(B) $\frac{-\cos(\sqrt{x})}{2\sqrt{x}}$
(C) $\cos(\sqrt{x})$

(D) $-\cos(\sqrt{x})$

Q39 $\frac{d}{dx}\left(e^{\sin(2x)}\right)$

(A) $e^{\sin(2x)}$

(B) $2\cos(2x)e^{\sin(2x)}$

(C) $\cos(2x)e^{\sin(2x)}$

(D) None of these

Q40 Find the derivative of the function $y = \left(\sqrt{1+\sin^2 x}\right)$ with respect to x.

(A) $\frac{\cos x}{\sqrt{1+\sin^2 x}}$

(B) $\frac{\sin 2x}{\sqrt{1+\sin^2 x}}$

(C) $\frac{\sin x \cos x}{\sqrt{1+\sin^2 x}}$

(D) $\frac{1}{2}\cos^2 x$

Q41 A uniform metallic solid sphere is heated uniformly. Due to thermal expansion, its radius increases at the rate of 0.05 mm/second. Find its rate of change of volume with respect to time when its radius becomes 10 mm. (take π =3.14)

(A) 31.4 mm^3/second

(B) 62.8 mm^3/second

(C) 3.14 mm^3/second

(D) 6.28 mm^3/second

Q42 A function is given as $y = \frac{x^3}{3} + \frac{x^2}{2} + \frac{x}{4}$. The first and second derivative of y with respect to x is:

(A) $\frac{dy}{dx} = x^2 - x + \frac{1}{4}, \frac{d^2y}{dx^2} = 2x + 3$

(B) $\frac{dy}{dx} = x^2 + x - \frac{1}{4}, \frac{d^2y}{dx^2} = 2x + 1$

(C) $\frac{dy}{dx} = x^2 + x + \frac{1}{4}, \frac{d^2y}{dx^2} = 2x + 1$

(D) $\frac{dy}{dx} = x^2 + x + \frac{1}{4}, \frac{d^2y}{dx^2} = 2x - 1$

Q43 Find the value of $\int_{-4}^{-1} \frac{\pi}{2} d\theta$

(A) π (B) $\frac{3\pi}{2}$

(C) $\frac{2\pi}{3}$ (D) $\frac{\pi}{2}$

Q44 If $\int_0^1 \left(t^2 + 9t + c\right)dt = \frac{9}{2}$ Then the value of 'c'.

(A) $\frac{2}{3}$ (B) $-\frac{1}{3}$

(C) $-\frac{2}{3}$ (D) $\frac{1}{3}$

Q45 Find the area under the curve $y = (-2x + 4)$ from $x = \frac{1}{2}$ to $x = \frac{3}{2}$.

(A) 2 square units (B) 4 square units

(C) 6 square units (D) 8 square units

Q46 If $\tan\theta = \frac{1}{\sqrt{5}}$ and θ lies in the first quadrant, the value of $\cos\theta$ is :

(A) $\sqrt{\frac{5}{6}}$ (B) $-\sqrt{\frac{5}{6}}$

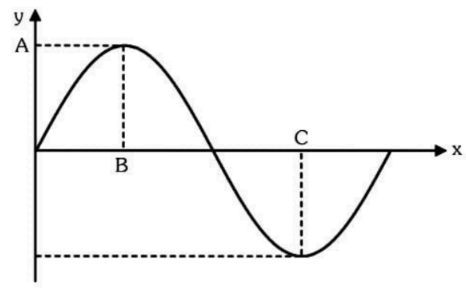
(C) $\frac{1}{\sqrt{6}}$ (D) $-\frac{1}{\sqrt{6}}$

Q47 What is the value of plane angle 105° in radian?

(A) $\frac{12\pi}{7}$ (B) $\frac{3\pi}{13}$

(C) $\frac{5\pi}{9}$ (D) $\frac{7\pi}{12}$

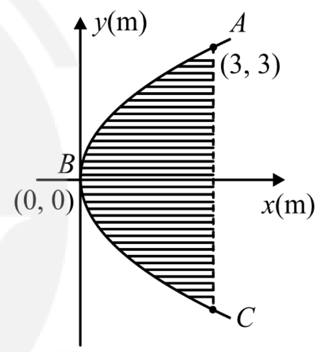
Q48 In the given figure, a function $y = 9\sin(3\pi x)$ is shown. What is the numerical value of expression $A(B + C)$?



(A) 5 (B) 3

(C) 9 (D) 6

Q49 If equation of curve ABC is $y^2 = 3x$. The area of shaded region as shown in figure is:



(A) 6 m^2 (B) 10 m^2

(C) 12 m^2 (D) 7 m^2

Q50 Using binomial approximation method, find value of $(9999)^{\frac{1}{4}}$

(A) $10\left(1 - \frac{1}{4000}\right)$

(B) $20\left(1 - \frac{1}{4000}\right)$

(C) $20\left(1 - \frac{1}{40000}\right)$

(D) $10\left(1 - \frac{1}{40000}\right)$

Answer Key

Q1 (B)
Q2 (A)
Q3 (C)
Q4 (C)
Q5 (C)
Q6 (C)
Q7 (C)
Q8 (B)
Q9 (C)
Q10 (B)
Q11 (A)
Q12 (C)
Q13 (C)
Q14 (B)
Q15 (C)
Q16 (B)
Q17 (A)
Q18 (A)
Q19 (A)
Q20 (B)
Q21 (B)
Q22 (D)
Q23 (D)
Q24 (D)
Q25 (B)
Q26 (C)
Q27 (D)
Q28 (C)
Q29 (B)
Q30 (D)
Q31 (B)
Q32 (C)
Q33 (A)
Q34 (A)
Q35 (A)
Q36 (A)
Q37 (A)
Q38 (A)
Q39 (B)
Q40 (C)
Q41 (B)
Q42 (C)
Q43 (B)
Q44 (B)
Q45 (A)
Q46 (A)
Q47 (D)
Q48 (D)
Q49 (C)
Q50 (D)

Hints & Solutions

Q1 Text Solution:

$$\frac{d}{dx}\left(\frac{x}{\sin x}\right)=\frac{\sin x\frac{d}{dx}\left(x\right)-x\frac{d}{dx}\left(\sin x\right)}{\left(\sin x\right)^2}$$

$$=\frac{(\sin x)(1)-x(\cos x)}{\sin^2 x}=\frac{\sin x-x\cos x}{\sin^2 x}$$

Q2 Text Solution:

(A)

$\int(6x+2)^3dx=\frac{1}{6}\int X^3dX$, where $X=6x+2$

$$=\frac{1}{6}\left(\frac{X^4}{4}\right)+c_1=\frac{(6x+2)^4}{24}+c_1$$

Q3 Text Solution:

(C)

For maximum and minimum value, we can put

$\frac{dy}{dx}=0.$

or $\frac{dy}{dx}=50x-10=0$

$\therefore\ x=\frac{1}{5}$

Further, $\frac{d^2y}{dx^2}=50$

or $\frac{d^2y}{dx^2}$ has positive value at $x=\frac{1}{5}$. Therefore, y has minimum value at $x=\frac{1}{5}$.

Substituting $x=\frac{1}{5}$ in given equation, we get

$y_{\min}=25\left(\frac{1}{5}\right)^2+5-10\left(\frac{1}{5}\right)=4$

Q4 Text Solution:

(C)

$$\sin 240^o=\sin(180^o+60^o)$$
$$=-\sin 60^o=-\frac{\sqrt{3}}{2}$$

Q5 Text Solution:

(C)

$\sin 45^0\cos 15^0$

$=2\ X\ \frac{1}{\sqrt{2}}X\ \cos\left(60^0-45^0\right)$

$=\sqrt{2}\left(\cos 60^0\ \cos 45^0+\ \sin 45^0\ \sin 60^0\right)$

$=\frac{1+\sqrt{3}}{2}$

Q6 Text Solution:

(C)

$A=\int_{x_1}^{x_2}y\,dx$

$=\int_0^5 2x^2dx$

$=2\left|\frac{x^3}{3}\right|_0^5$

$=\frac{2}{3}\left(5^3-0^3\right)=\frac{250}{3}$unit

Q7 Text Solution:

(C)

Let x is one of the parts of 10, then second will be $10-x$. If y is their product, then

$y=x(10-x)$

$=10x-x^2$.

For maximum value of y, $\frac{dy}{dx}=0$,

or $\frac{d}{dx}\left(10x-x^2\right)=0$

or $10-2x=0$

or $x=5$

Thus 5 and 5 are the two required parts. Their product is 25.

Q8 Text Solution:

(B)

$g' = gR^2/(R+h)^2 = gR^2 / [R(1 + h/R)]^2 = gR^2/ [R^2(1 + h/R)^2]$

$g'= g / (1 + h/R)^2 = g (1 + h/R)^{-2}$

Using the binomial approximation $(1+x)^n\approx 1+ nx$ for small x (here x = h/R and n = -2)

$g'-g(1 + (-2)(h/R)) = g(1-2h/R)$.

Q9 Text Solution:

(C)

Force F = -dU/dr.

$U = Ar^{-2} - Br^{-1}$

$dU/dr = -2Ar^{-3} -(-1)Br^{-2} = -2A/r^3 + B/r^2$

$F = -(-2A/r^3 + B/r^2) = 2A/r^3 - B/r^2$

For equilibrium, F = 0:

$2A/r^3 - B/r^2 = 0$

$2A/r^3 = B/r^2$

Assuming $r\neq 0$, we can multiply by r^3

2A = Br

r = 2A/B.

Q10 Text Solution:

(B)

Statement-I: The definite integral $\int_a^b$ f(x) dx represents the net area (algebraic sum of areas above x-axis minus areas below x-axis) between the curve y=f(x), the x-axis, and the lines x=a and x=b. (True)

Statement-II: Integration is indeed the reverse process of differentiation (Fundamental Theorem of Calculus Part I relates antiderivatives to integration). (True)

However, Statement-II, while true, doesn't directly explain why the definite integral represents an area. The concept of the definite integral as a limit of Riemann sums is what establishes its geometric meaning as area. The fundamental theorem then provides a method to calculate this area using antiderivatives.

Q11 Text Solution:

(A)

Statement 1: If f'(c) = 0 and f"(c) > 0, then f(x) has a local minimum at x = c. This is the second derivative test for a local minimum. (True)

Statement 2: A function can have a local maximum or minimum at a point where its derivative does not exist (e.g., y = |x| has a minimum at x=0, but dy/dx is undefined at x=0). These are critical points. (True)

Statement 3: For a particle whose motion is described by x(t), if its velocity v(t) = 0 at time to, its acceleration a(to) does not have to be zero. For example, a ball thrown upwards has v=0 at its highest point, but a = -g 10. (False)

Q12 Text Solution:

(C)

$$3x-3y-1=0$$
$$3y=3x-1$$
$$y=x-\frac{1}{3}$$

Q13 Text Solution:

(C)

$$\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=x+\frac{1}{x}+2$$
$$\frac{d}{dx}\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=1-\frac{1}{x^2}$$

Q14 Text Solution:

(B)

$$x^2+7x+12=0$$
$$(x+3)(x+4)=0$$
$$x=-3,-4$$

Q15 Text Solution:

(C)

$$P^2=2m\,E.$$
$$m\propto P^2$$

Q16 Text Solution:

(B)

We use the binomial approximation $(1 + x)^n \approx 1 + nx$ for small |x|.

$(1.002)^{10}$ can be written as $(1 + 0.002)^{10}$.

Here, x = 0.002 and n = 10.   0

Since x = 0.002 is small, the approximation is valid.

$(1 + 0.002)^{10} \approx 1 + (10)(0.002)$

$\approx 1 + 0.020$

≈ 1.020.

Q17 Text Solution:

(A)

The curve cuts the y-axis when x = 0.

At x = 0, y = $(0)^3$ - 3(0) + 2 = 2. So the point is (0,2).

The slope of the tangent is given by the derivative dy/dx.

dy/dx = d/dx (x^3 - 3x + 2)

dy/dx = $3x^3$ - 3

At the point (0, 2) (i.e., when x = 0), the slope is:

dy/dx l_(x=0) = $3(0)^2$ - 3 = 0 - 3 = -3.

Q18 Text Solution:

(A)

Restoring force (F) = mg sinθ

when angle θ is small and expressed in radian, then sin $\theta \approx \theta$, then F = - mg θ

$\theta = \frac{x}{L}$,hence constant of proportionality is $\frac{mg}{L}$

Q19 Text Solution:

(A)

$$\int(1/(2\sqrt{x})+2\cos(2x))dx$$
$$=\int(1/(2\sqrt{x})dx+\int 2\cos(2x)dx$$
$$=(1/2)\times\left[x^{1/2}/(1/2)\right]+2\times[\sin(2x)/2]+C$$
$$=x^{(1/2)}+\sin(2x)+C$$
$$\sqrt{x}+\sin(2x)+C$$

Q20 Text Solution:

(B)

Average value of f(t) over [a,b] is (1/(b-a)) $\int_a^b$ f(t) dt.

Here v(t) = $3t^2$ - 2t, a = 0, b = 2.

$V_{avg} = \int_0^2 (3t^2 - 2t)\,dt$

$$=\left(\frac{1}{2}\right)\left[3\left(\frac{t^3}{3}\right)-2\left(\frac{t^2}{2}\right)\right]_0^2$$
$$=\left(\frac{1}{2}\right)\left[t^3-t^2\right]_0^2$$

= (1/2) [(2^3 - 2^2) - (0^3 - 0^2)]

= (1/2) [(8 - 4) - 0]

= (1/2) [4] = 2 m/s.

Q21 Text Solution:

(B)

For the quadratic equation ax^2 + bx + c = 0,

Sum of roots: $\alpha + \beta$ = -b/a

Product of roots: $\alpha\beta$ = c/a

Given equation: x^2 - 6x + 4 = 0. Here a=1, b=-6, c=4.

$\alpha + \beta$ = -(-6)/1 = 6.

$\alpha\beta$ = 4/1 = 4.

We need to find $\alpha^2 + \beta^2$.

We know that $(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$.

So,$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$.

$\alpha^2 + \beta^2$ = (6)^2 - 2(4)
$\alpha^2 + \beta^2$ = 36 - 8
$\alpha^2 + \beta^2$ = 28.

Q22 Text Solution:

$\log_e(x+5) - \log_e(x) = \log_e 3$

$\log_e\left(\frac{x+5}{x}\right) = \log_e 3$

$\frac{x+5}{x} = 3$

$x + 5 = 3x$

$2x = 5$

$x = \frac{5}{2}$

Q23 Text Solution:

(4)

$\log_2 8 + \log_2 2 + \log_2 (4)^2$

$= 3 + 1 + 2(2) = 8$

Q24 Text Solution:

(4)

$Y = \frac{1}{(n-1)^2} - \frac{1}{n^2}$

$= \frac{n^2-(n-1)^2}{(n-1)^2 n^2}$

$= \frac{n^2-n^2-1+2n}{(n-1)^2 n^2}$

$= \frac{2n-1}{n^2(n-1)^2}$

As $n >> 1$

$2n - 1 \approx 2n$ and $(n-1)^2 \approx n^2$

$\therefore \ Y \approx \frac{2n}{n^2.n^2} = \frac{2}{n^3}$

Q25 Text Solution:

(2)

$\sqrt{99} = \sqrt{100 - 1}$

$\sqrt{99} = \sqrt{100\left(1 - \frac{1}{100}\right)}$

$\sqrt{99} = 10\left(1 - \frac{1}{100}\right)^{\frac{1}{2}}$

Let $x = -\frac{1}{100}$ and $n = \frac{1}{2}$.

We know, $(1+x)^n \approx 1 + nx$

$\left(1 - \frac{1}{100}\right)^{\frac{1}{2}} \approx 1 + \left(\frac{1}{2}\right)\left(-\frac{1}{100}\right)$

$\left(1 - \frac{1}{100}\right)^{\frac{1}{2}} \approx 1 - \frac{1}{200}$

$\left(1 - \frac{1}{100}\right)^{\frac{1}{2}} \approx 0.995$

$\sqrt{99} = 10\left(1 - \frac{1}{100}\right)^{\frac{1}{2}}$

$\sqrt{99} \approx 10(0.995)$

$\sqrt{99} \approx 9.95$

Q26 Text Solution:

(3)

For x intercept put $y = 0$

$2x + 3 = 0$

$x = -\frac{3}{2}$

Q27 Text Solution:

(4)

$2\sin A \cos A = \sin 2A = \sin 150^\circ$

= sin(180° – 30°)

= sin 30

$= \frac{1}{2}$

Q28 Text Solution:

(3)

$\theta = \frac{AB}{R} = \frac{\pi}{7}$rad

Q29 Text Solution:

(2)

Sum of roots $= \frac{-b}{a} = \frac{-(-1)}{2} = \frac{1}{2}$

Q30 Text Solution:

(4)

$\frac{d}{dx}\frac{1}{\sqrt[4]{x^3}} = \frac{d}{dx}\left(x^{-3/4}\right)$

$= \frac{-3}{4}x^{-7/4}$

Q31 Text Solution:

(2)

As $y^2 \propto x$

or $y \propto \sqrt{x}$

So, both II and III will give a straight line graph.

Q32 Text Solution:

(3)

$\cos 150^\circ = \cos\left(180^\circ - 30^\circ\right) = -\cos 30^\circ$

$= \frac{-\sqrt{3}}{2}$

Q33 Text Solution:

(1)

$y = e^x + \sqrt{x} + 1$

$\frac{dy}{dx} = e^x + \frac{1}{2}(x)^{-1/2}$

Q34 Text Solution:

(1)

Area

$= \int_0^2 y dx = \int_0^2 (x^2 + a)\ dx = \left[\frac{x^3}{3} + ax\right]_0^2$

$\frac{8}{3} + 2a = \frac{11}{3}$

$\Rightarrow a = \frac{1}{2}$

Q35 Text Solution:

(1)

For $y = a\sin\theta + b\cos\theta$

$y_{\max} = \sqrt{a^2 + b^2}$

Q36 Text Solution:

(1)

$y' = \frac{(3x-2)(2)-(2x+5)(3)}{(3x-2)^2} = \frac{-19}{(3x-2)^2}$

Q37 Text Solution:

(1)

Only A and B are correct

cos $(A + B)$ = cos$A$ cos$B$ – sin$A$ sin$B$

Q38 Text Solution:

(1)

Using chain rule $\frac{dy}{dx} = (\cos\sqrt{x})\left(\frac{1}{2\sqrt{x}}\right)$

Q39 Text Solution:

(2)

$\frac{d}{dx}\left(e^{\sin 2x}\right)$

$= e^{\sin 2x}\frac{d}{dx}(\sin 2x)$

$= 2e^{\sin 2x}\cos 2x$

Q40 Text Solution:

(3)

$\frac{1}{2}\left(1+\sin^2 x\right)^{-1/2}\frac{d}{dx}\left(\sin^2 x+1\right)$

$= \frac{1}{2\sqrt{1+\sin^2 x}} \times 2\sin x.\cos x$

$= \frac{\sin x \cos x}{\sqrt{1+\sin^2 x}}$

Q41 Text Solution:

(2)

$\mathrm{vol} = \frac{4}{3}\pi r^3$

$\frac{d(\mathrm{vol})}{dt} = \left(\frac{4}{3}\pi\right)3r^2\frac{dr}{dt}$

$\frac{dV}{dt} = 4\pi r^2\frac{dr}{dt}$

$\frac{d(\mathrm{vol})}{dt} = 4\pi \times \left(10\right)^2 \times 0.05 = 20\pi = 62.8$

$\frac{\mathrm{mm}^3}{\mathrm{sec}}$

Q42 Text Solution:

(3)

$\frac{dy}{dx} = x^2 + x + \frac{1}{4}, \frac{d^2y}{dx^2} = 2x+1$

Q43 Text Solution:

(2)

$\frac{\pi}{2}\int\limits_{-4}^{-1} d\theta = \frac{\pi}{2}[\theta]_{-4}^{-1} = \frac{\pi}{2}\left[\left(-1\right)-\left(-4\right)\right]$

$= \frac{3\pi}{2}$

Q44 Text Solution:

(2)

$\int_0^1\left(t^2+9t+c\right)dt = \frac{9}{2}$

$\left[\frac{t^3}{3}+\frac{9}{2}t^2+ct\right]_0^1 = \frac{9}{2}$

$\frac{1}{3}+\frac{9}{2}+c = \frac{9}{2}$

$c = -\frac{1}{3}$

Q45 Text Solution:

(1)

$\int_{1/2}^{3/2}\left(-2x+4\right)dx$

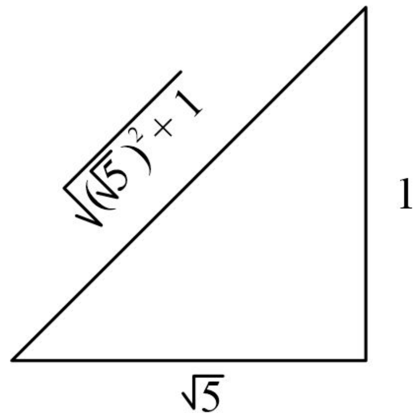
$\left[-x^2+4x\right]_{1/2}^{3/2}$

$= \left[-\left(\frac{3}{2}\right)^2+4\left(\frac{3}{2}\right)\right] - \left[-\frac{1}{4}+4\times\frac{1}{2}\right]$

2 square units.

Q46 Text Solution:

(1)



$\tan\theta = \frac{1}{\sqrt{5}} = \frac{p}{b}$

$h = \sqrt{p^2+b^2} = \sqrt{6}$

$\therefore\ \cos\theta = b = \frac{\sqrt{5}}{\sqrt{6}}$

Q47 Text Solution:

(4)

π radian = 180°

$105^\circ = \frac{\pi}{180}\times 105 = \frac{7\pi}{12}$ radian

Q48 Text Solution:

(4)

$y = 9\sin 3\pi x$

Amplitude = 9

$\therefore\ A = 9$

and at $y = 9$

$\sin 3\pi x = 1$

$\Rightarrow 3\pi x = \frac{\pi}{2}$

$\therefore x = \frac{1}{6} = B$

And at $y = -9$

$x = \frac{+1}{2} = C$

$\therefore A\left(B+C\right) = 9\left(\frac{1}{6}+\frac{1}{2}\right) = 6$

Q49 Text Solution:

(3)

$A = 2\int\limits_{x=0}^{x=3} y dx = 2\int\limits_0^3 (3x)^{\frac{1}{2}} dx$

$= 2\sqrt{3}\left(\frac{2x^{\frac{3}{2}}}{3}\right)_0^3 = 2\sqrt{3}\times\frac{2}{3}\left((3)^{\frac{3}{2}}\right)$

$= 12\,\mathrm{m}^2$

Q50 Text Solution:

(4)

$(9999)^{\frac{1}{4}} = (10000-1)^{\frac{1}{4}}$

$= 10\left(1-\frac{1}{10^4}\right)^{\frac{1}{4}} = 10\left(1-\frac{1}{40000}\right)$