

2020 Advanced Mathematics 1 Paper 1

1. Given that α and β are the two roots of $x^2 + mx + 7 = 0$ and $\alpha^2 + \beta^2 = 22$. Find the possible values of m . Ans C [1. Quadratic equation]

A ± 4 B ± 5 C ± 6 D ± 7

2. Given that the inverse of the matrix $\begin{pmatrix} x & -10 & 38 & 4 \\ x & +1 \end{pmatrix}$ exists. Find the range of x .

Ans. D [7. Matrices and determinants]

A $x \in \mathbb{R}$ B $x = -9$ or $x = 18$
C $-9 \leq x \leq 18$ D $x < -9$ or $-9 < x < 18$ or $x > 18$

3. Given that vectors $\underline{a} = (h+1)\underline{i} + 4\underline{j}$, $\underline{b} = 7\underline{i} - 5\underline{j}$, where h is a constant. If \underline{a} is parallel to \underline{b} , find h .

Ans. A [14. Vector]

A $-\frac{33}{5}$ B $-\frac{28}{5}$ C $\frac{28}{5}$ D $\frac{33}{5}$

4. Given that the $\frac{x^2+x+1}{(x+1)^3} \equiv \frac{A}{(x+1)^3} + \frac{B}{(x+1)^2} + \frac{C}{x+1}$. Find $A + B + C$. Ans. B [3. Rational expression]

A 0 B 1 C 2 D 3

5. How many solutions does the equation $\sqrt{x+1} = x-5$ have? Ans. B [4. Irrational expression]

A No solution B 1 solution C 2 solutions D 3 solutions

6. Given that $\sqrt{22 + 8\sqrt{6}} = a + \sqrt{b}$, where a and b are integers. Find $a + b$.
Ans. C [4. Irrational expression]

A 4 B 60 C 10 D 16

7. Solve the inequality $\frac{2x^2-3x+1}{x^2+5x+6} \geq 0$ Ans. D [8. Inequalities and linear programming]

A $x \in \mathbb{R}$

B $x > 1$

C $x \leq \frac{1}{2}$ or $x > 1$

D $x < -3$ or $-2 < x \leq \frac{1}{2}$ or $x \geq 1$

8. How many natural numbers can be formed using the digits 0, 1, 3 and 5 without repetition?

Ans. C [9. Permutation and Combination]

A 3

B 30

C 48

D 49

9. Abu plays against Ali in a badminton match. The match will end when anyone of them wins two out of three sets. If the probability of Abu winning in each set is 0.35, find the probability that the match will end in two sets. Ans. D [11. Probabilities]

A 0.1225

B 0.3

C 0.4225

D 0.545

10. Given that P and Q are two points which lie on the parallel of latitude of $60^\circ N$. The longitudes of P and Q are $30^\circ E$ and $150^\circ W$ respectively. Calculate their shortest distance measured along the surface of the earth. Ans. B [21. Latitude and longitude]

A 1800 nautical miles

B 3600 nautical miles

C 5400 nautical miles

D 7200 nautical miles

11. As shown in Fig.1, a 100cm long wire is bent to form a sector AOB with radius 35cm. Find the area of ΔAOB . Ans. A [15. Definition of angle and units of angle]

A 463.03 cm^2

B 525 cm^2

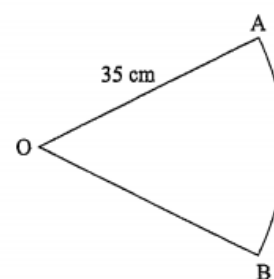


Fig. 1

C 563.16cm^2

D 714.58cm^2

12. Given that in $\triangle ABC$, $a : b : c = (\sqrt{3} + 1) : 2 : \sqrt{2}$. Find the **SMALLEST** interior angle of this triangle.

Ans. C [18. Solution of triangles.]

A 15°

B 22.5°

C 30°

D 45°

13. Given that $\tan 40^\circ = \frac{a}{b}$, where $a, b > 0$. Express $\sin 2020^\circ$ in terms of a and b .

Ans. A [17. Trigonometric functions of any angle]

A $-\frac{a}{\sqrt{a^2+b^2}}$

B $-\frac{b}{\sqrt{a^2+b^2}}$

C $\frac{a}{\sqrt{a^2+b^2}}$

D $\frac{b}{\sqrt{a^2+b^2}}$

14. Given that the line $kx + 3y + k + 6 = 0$ does not pass through the first quadrant. Find the range

of k . Ans. D [23. The straight line]

A $k < -6$

B $k \geq -6$

C $-6 \leq k < 0$

D $k \geq 0$

15. Find the obtuse angle between the lines $\sqrt{3}x + y = 11$ and $\sqrt{3}x - y = 12$.

Ans. A [23. The straight line]

A 120°

B 135°

C 150°

D 165°

16. Find the longest distance from the point $(3, 5)$ to the circle $x^2 + y^2 + 8x - 2y + 8 = 0$

Ans. B [24. The circle]

A $\sqrt{65} + 6$

B $\sqrt{65} + 3$

C $\sqrt{65}$

D $\sqrt{65} - 3$

17. Find $\frac{x^4 - 3x^3}{x^2 - 9}$. Ans. A [Limit and Continuity]

A $4\frac{1}{2}$

B 4

C $3\frac{1}{2}$

D 3

18. The surface area of a sphere increases at a constant rate of $12\pi cm^2 s^{-1}$. Find the rate change of

the radius of the sphere when the radius is $\frac{3}{4}cm$. Ans. B [27. Applications of differentiation]

A $1cms^{-1}$.

B $2cms^{-1}$.

C $3cms^{-1}$.

D $4cms^{-1}$.

19. Find $\int \cot^2(-3x + 4)dx$. Ans. B [28. Indefinite integrals]

A $\frac{1}{3}\cot \cot(-3x + 4) + x + C$

B $\frac{1}{3}\cot \cot(-3x + 4) - x + C$

C $-\frac{1}{3}\cot \cot(-3x + 4) + x + C$

D $-\frac{1}{3}\cot \cot(-3x + 4) - x + C$

20. As shown in Fig.2, the area of the shaded region bounded by the curve $y = ax^2 + b$, and the line $y = ax + b$ is 1. If one of the points of the intersection of the curve and the line lies on the x -axis, find a . Ans. C [29. Definite integrals and its applications]

A 2

B 4

C 6

D 8

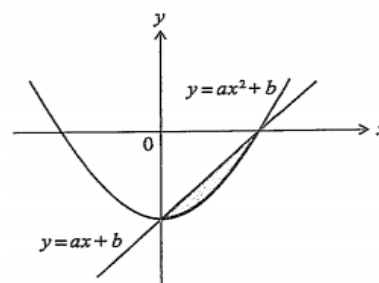


Fig. 2