Most Important & Repeated Maths Questions in JEE Main with Solutions PDF

Mathematics: Most Important & Repeated Questions

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1. Quadratic Equation:
Find the roots of the quadratic equation x2−5x+6=0x^2 - 5x + 6 = 0x2−5x+6=0.

Solution:

$x=5±25−242=5±12x = \frac{5 \pm \sqrt{25 - 24}}{2} = \frac{5 \pm 1}{2}x=25±25−24=25±1$

Roots: x=3,2x = 3, 2x=3,2

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2. Arithmetic Progression (AP):
Find the 10th term and sum of first 10 terms of the AP: 2, 5, 8, 11,...

Solution:

- Common difference d=3d = 3d=3
- $a10=a+(10−1)d=2+9×3=29a_{10} = a + (10-1)d = 2 + 9 \times 3 = 29a10=a+(10−1)d=2+9×3=29$
- $Sum, S10=102(2+29)=5×31=155S_{10} = \frac{10}{2} (2 + 29) = 5 \times 31 = 155S10=210(2+29)=5×31=155$

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3. Complex Numbers:
Find the modulus and argument of the complex number z=1+i3z = 1 + i\sqrt{3}z=1+i3.

Solution:

- Modulus r=12+(3)2=1+3=2r = \sqrt{1^2 + (\sqrt{3})^2} = \sqrt{1+3} = 2r=12+(3)2=1+3=2
- Argument θ=tan−1(31)=π3\theta = \tan^{-1} \left(\frac{\sqrt{3}}{1}\right) = \frac{\pi}{3}θ=tan−1(13)=3π

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4. Binomial Theorem:
Find the coefficient of x3x^3x3 in (1+2x)5(1 + 2x)^5(1+2x)5.

Solution:
Coefficient of x3x^3x3 is:

(53)(1)5−3(2x)3=10×1×8=80{5 \choose 3} (1)^{5-3} (2x)^3 = 10 \times 1 \times 8 = 80(35)(1)5−3(2x)3=10×1×8=80

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5. Permutations and Combinations:
How many ways can 3 students be selected from a group of 7?

Solution:

(73)=7×6×53×2×1=35{7 \choose 3} = \frac{7 \times 6 \times 5}{3 \times 2 \times 1} = 35(37)=3×2×17×6×5=35

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6. Straight Lines:
Find the equation of a line passing through (2,3) and having slope 4.

Solution:

y−3=4(x−2)⇒y=4x−8+3=4x−5y - 3 = 4(x - 2) \Rightarrow y = 4x - 8 + 3 = 4x - 5y−3=4(x−2)⇒y=4x−8+3=4x−5

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7. Circles:
Find the center and radius of the circle x2+y2−6x+8y+9=0x^2 + y^2 - 6x + 8y + 9 = 0x2+y2−6x+8y+9=0.

Solution:
Rewrite in standard form:

(x2−6x)+(y2+8y)=−9(x^2 - 6x) + (y^2 + 8y) = -9(x2−6x)+(y2+8y)=−9

Complete the square:

(x2−6x+9)+(y2+8y+16)=−9+9+16(x^2 - 6x + 9) + (y^2 + 8y + 16) = -9 + 9 + 16(x2−6x+9)+(y2+8y+16)=−9+9+16 (x−3)2+(y+4)2=16(x - 3)^2 + (y + 4)^2 = 16(x−3)2+(y+4)2=16

Center: (3,−4)(3, -4)(3,−4), Radius: 444

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8. Limits:
Evaluate limx→0sin3xx\lim_{x \to 0} \frac{\sin 3x}{x}limx→0xsin3x.

Solution:
Using limx→0sinaxx=a\lim_{x \to 0} \frac{\sin ax}{x} = alimx→0xsinax=a,

limx→0sin3xx=3\lim_{x \to 0} \frac{\sin 3x}{x} = 3x→0limxsin3x=3

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9. Differentiation:
Find the derivative of y=x3−5x2+6xy = x^3 - 5x^2 + 6xy=x3−5x2+6x.

Solution:

dydx=3x2−10x+6\frac{dy}{dx} = 3x^2 - 10x + 6dxdy=3x2−10x+6

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10. Integration:
Evaluate ∫(2x3−3x2+x)dx\int (2x^3 - 3x^2 + x) dx∫(2x3−3x2+x)dx.

Solution:

∫(2x3−3x2+x)dx=2x44−3x33+x22+C=x42−x3+x22+C\int (2x^3 - 3x^2 + x) dx = \frac{2x^4}{4} - \frac{3x^3}{3} + \frac{x^2}{2} + C = \frac{x^4}{2} - x^3 + \frac{x^2}{2} + C∫(2x3−3x2+x)dx=42x4−33x3+2x2+C=2x4−x3+2x2+C
