

IPMAT / JIPMAT / IIM-B — PYQ Practice Sheet

Algebra: Polynomials & Quadratic Equations — Sheet 2

IPMAT Indore 2025 | Algebra > Polynomials | Hard

Q1. Let $P(x)$ be a quadratic polynomial such that

$$|P(0)P(1)|$$

$$|P(0)P(2)| = 0$$

Let $P(0) = 2$ and $P(1) + P(2) + P(3) = 14$. Then $P(4)$ equals

- (a) -14
- (b) 30
- (c) -6
- (d) 16

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Q2. Let $f(x) = a^2x^2 + 2bx + c$ where $a \neq 0$, b , c are real numbers and x is a real variable, then

- (a) $f(x)$ has a maximum and a minimum
- (b) $f(x)$ has a minimum and no maximum
- (c) $f(x)$ has a maximum and no minimum
- (d) $f(x)$ has no minimum and no maximum

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Q3. If x , y are real numbers and equations $x^2 - 12x + 35 = 0$ and $x^2 + ax + 105 = 0$ have at least one common root, then the minimum possible value of $y^2 + 4y - 5a$ is ___

Entered answer: _____

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Q4. The equation $2^x - x^2 = 0$ has

- (a) exactly one real solution
- (b) exactly two real solutions
- (c) no real solution
- (d) exactly three real solutions

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Q5. The number of values a can take such that $x^4 + ax^3 + (3a - 4)x^2 + 2(a - 1)x - 4$ can be expressed as a product of two quadratic polynomials, $x^2 + px + 2$ and $x^2 + qx - 2$, where p and q are real, is

- (a) 2
- (b) 1
- (c) 0
- (d) 3

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Q6. Positive reals x, y satisfy $x \neq y$ and $(x^2 + y^2)/(xy) = k$. If replacing x by $x + y$ and y by $|x - y|$ leaves the value of k unchanged, then k equals

- (a) 1
- (b) $2\sqrt{2}$
- (c) 2
- (d) $\sqrt{2}$

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Q7. If the minimum value of $f(x) = x^2 + 2bx + 2c^2$ is greater than the maximum value of $g(x) = -x^2 - 2cx + b^2$, then for real value of x :

- (a) $|c| > \sqrt{2}|b|$
- (b) $\sqrt{2}|c| > b$
- (c) $0 < c < \sqrt{2}b$
- (d) no real value of a

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Q8. The set of all real numbers x for which $x^2 - |x + 2| + x > 0$, is

- (a) $(-\infty, -2) \cup (2, \infty)$
- (b) $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$
- (c) $(-\infty, -1) \cup (1, \infty)$
- (d) $(\sqrt{2}, \infty)$

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Q9. The value of $(25.732^2 - 15.732^2)$ is

- (a) 4.1464
- (b) 41.464
- (c) 414.64
- (d) 4146.4

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Q10. Match List I with List II. Choose the correct answer from the options given below:

List I (Quadratic Equation): A. $6x^2 + x - 12 = 0$ B. $8x^2 + 16x - 10 = 202$ C. $x^2 + 45x + 324 = 0$ D. $2x^2 - 5x - 3 = 0$

List II (Roots): I. $(-6, 4)$ II. $(9, 36)$ III. $(3, -1/2)$ IV. $(-3/2, 4/3)$

- (a) A-I, B-III, C-IV, D-II
- (b) A-IV, B-I, C-II, D-III
- (c) A-II, B-IV, C-III, D-I
- (d) A-III, B-II, C-I, D-IV

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Q11. Which of the following is the value of m for which the polynomial $x^4 + 10x^3 + 25x^2 + 15x + m$ is exactly divisible by $x + 7$?

- (a) -91
- (b) -101
- (c) 15
- (d) 115

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Q12. If $\sin(\alpha)$ and $\cos(\alpha)$ are the roots of the equation $ax^2 + bx + c = 0$, then b^2 is

- (a) $c^2 + 2ac$
- (b) $a^2 + ac$
- (c) $a^2 + 2ac$
- (d) $c^2 + ac$

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Q13. The value of $(325 \times 325 \times 325 + 175 \times 175 \times 175) / (325 \times 325 - 325 \times 175 + 175 \times 175)$ is

- (a) 143755
- (b) 1125
- (c) 9575
- (d) 500

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Q14. The graph of a polynomial $y = f(x)$ is shown in the figure below, then the number of its zeros is:

- (a) 4
- (b) 3

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Q15. Given below are two statements: T | Olympiads | Foundation

Statement (I): $(x^2 + 3x + 1) = (x - 2)^2$ is not a quadratic equation.

Statement (II): The nature of roots of quadratic equation $x^2 + 2x\sqrt{3} + 3 = 0$ are real and equal.

In light of the above statements, choose the most appropriate answer:

- (a) Both Statement (I) and Statement (II) are true.
- (b) Both Statement (I) and Statement (II) are false.
- (c) Statement (I) is true but Statement (II) is false.
- (d) Statement (I) is false but Statement (II) is true.

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Q16. If the roots of the equation $x^2 - px + 54 = 0$ are in the ratio 2 : 3, then value of p is:

- (a) 18
- (b) 21
- (c) -21
- (d) 15

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Q17. If α and β are the roots of the equation $ax^2 + bx + c = 0$, then the value of $1/(a\alpha + b) + 1/(a\beta + b)$ is:

- (a) $a/(bc)$
- (b) $b/(ac)$
- (c) $c/(ab)$
- (d) $1/(abc)$

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Q18. The factors of polynomial $x^3 - 6x^2 + 11x - 6$ are:

- (a) $(x + 1)(x + 2)(x + 3)$
- (b) $(x - 1)(x + 2)(x + 3)$
- (c) $(x - 1)(x - 2)(x - 3)$
- (d) $(x - 1)(x - 2)(x + 3)$

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Q19. If highest common factor of $x^2 - px - q$ and $5x^2 - 3px - 15q$ is $(x - 3)$, then value of (p, q) will be:

- (a) $(5/3, 4)$
- (b) $(-5/3, -4)$
- (c) $(5/2, 3/2)$
- (d) $(4, -3/5)$

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Q20. Amit and Alok attempted to solve a quadratic equation. Amit made a mistake in writing down the constant term and ended up with roots $(4, 3)$. Alok made a mistake in writing down coefficient of x to get roots $(3, 2)$. The correct roots of the equation are:

- (a) $-4, -3$
- (b) $6, 1$
- (c) $4, 3$
- (d) $-6, -1$

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Q21. $(4.53 - 3.07)^2 / [(3.07 - 2.15)(2.15 - 4.53)] + (3.07 - 2.15)^2 / [(2.15 - 4.53)(4.53 - 3.07)] + (2.15 - 4.53)^2 / [(4.53 - 3.07)(3.07 - 2.15)]$ is simplified to

- (a) 0
- (b) 1
- (c) 2
- (d) 3

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Q22. If $x^3 + y^3 = 468$ and $x + y = 12$, then value of $x^4 + y^4$ will be

- (a) 3620

- (b) 2036
- (c) 3025
- (d) 3026

Answer Key

Q1: (c)	Q2: (b)	Q3: 106	Q4: (d)	Q5: (b)
Q6: (b)	Q7: (a)	Q8: (b)	Q9: (c)	Q10: (b)
Q11: (a)	Q12: (c)	Q13: (d)	Q14: (b)	Q15: (a)
Q16: (d)	Q17: (b)	Q18: (c)	Q19: (c)	Q20: (b)
Q21: (d)	Q22: (d)			



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