Conceptual Multiple Choice Questions: Equations Reducible to Quadratic Form

Exercise 4.2 (Class 11 Mathematics, Chapter 4)

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MCQs

1. The equation $x^4 - 5x^2 + 4 = 0$ is of:

(a) Type I
(b) Type II
(c) Type III
(d) Type IV

2. For $x^4 - 6x^2 + 8 = 0$, the substitution to reduce to quadratic form is:

(a) $x = y$
(b) $x^2 = y$
(c) $x^4 = y$
(d) $x + \frac{1}{x} = y$

3. The solution set of $x^6 - 9x^3 + 8 = 0$ includes:

(a) $\{1, 2\}$
(b) $\{-1, -2\}$
(c) $\{\sqrt{2}, -\sqrt{2}\}$
(d) $\{0, 1\}$

4. To solve $x^2 - 10 = 3x^{-1}$, the correct substitution is:

(a) $x = y$
(b) $x^{-1} = y$
(c) $x^2 = y$
(d) $x^{-2} = y$

5. The equation $(x + 1)(x + 2)(x + 3)(x + 4) = 24$ satisfies:

(a) $1 + 4 = 2 + 3$
(b) $1 + 2 = 3 + 4$
(c) $1 + 3 = 2 + 4$
(d) No such pairing exists

6. Solving $(x - 5)(x - 7)(x + 6)(x + 4) - 504 = 0$ gives the solution set:

(a) $\{-7, -2, 3, 8\}$

(b) $\{-8, -3, 2, 7\}$

(c) $\{-6, -1, 4, 9\}$

(d) $\{-5, 0, 5, 10\}$

7. For $4 \cdot 2^{2x+1} - 9 \cdot 2^x + 1 = 0$, the substitution is:

(a) $2^{2x} = y$

(b) $2^x = y$

(c) $2^{x+1} = y$

(d) $x = y$

8. The solution set of $2^x + 2^{-x+6} - 20 = 0$ is:

(a) $\{2, 4\}$

(b) $\{-2, -4\}$

(c) $\{1, 3\}$

(d) $\{0, 5\}$

9. The equation $x^4 - 3x^3 + 4x^2 - 3x + 1 = 0$ is:

(a) Type I

(b) Type II

(c) Type III

(d) Type IV

10. To solve $6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$, use the substitution:

(a) $x^2 = y$

(b) $x + \frac{1}{x} = y$

(c) $x^4 = y$

(d) $x - \frac{1}{x} = y$

11. The solution set of $\left(x + \frac{1}{x}\right)^2 - 3\left(x + \frac{1}{x}\right) - 4 = 0$ includes:

(a) $2 + \sqrt{3}$

(b) $\sqrt{2}$

(c) 1

(d) -3

12. For $x^2 + x - 4 + \frac{1}{x} + \frac{1}{x^2} = 0$, the substitution is:

(a) $x^2 + \frac{1}{x^2} = y$

(b) $x + \frac{1}{x} = y$

(c) $x - \frac{1}{x} = y$

(d) $x^2 = y$

13. The solution set of $2x^4 + 3x^3 - 4x^2 - 3x + 2 = 0$ is:

(a) $\left\{-2, -1, \frac{1}{2}, 1\right\}$
(b) $\{-1, 0, 1, 2\}$
(c) $\left\{-\frac{1}{2}, 0, \frac{1}{2}, 1\right\}$
(d) $\{-3, -2, 1, 2\}$

14. For $4^x - 3 \cdot 2^{x+3} + 128 = 0$, the solution set is:

(a) $\{3, 4\}$
(b) $\{2, 5\}$
(c) $\{1, 6\}$
(d) $\{0, 7\}$

15. The equation $(2x - 7)(x^2 - 9)(2x + 5) - 91 = 0$ uses the substitution:

(a) $2x^2 - x = y$
(b) $x^2 - 9 = y$
(c) $x^2 + x = y$
(d) $2x = y$

16. The solution set of $\left(x - \frac{1}{x}\right)^2 + 3\left(x + \frac{1}{x}\right) = 0$ includes:

(a) $-2 + \sqrt{3}$
(b) 2
(c) -1
(d) $\sqrt{3}$

17. For $x^4 - 6x^2 + 10 - \frac{6}{x^2} + \frac{1}{x^4} = 0$, the substitution is:

(a) $x^2 + \frac{1}{x^2} = y$
(b) $x^4 = y$
(c) $x + \frac{1}{x} = y$
(d) $x^2 = y$

18. The solution set of $3^{2x-1} - 12 \cdot 3^x + 81 = 0$ is:

(a) $\{2, 3\}$
(b) $\{1, 4\}$
(c) $\{0, 5\}$
(d) $\{-1, 2\}$

19. For $(x + 1)(2x + 3)(2x + 5)(x + 3) = 945$, the solution set includes:

(a) -6
(b) 0

(c) 1

(d) 3

20. The equation $2x^4 - x^3 + x^2 - 3x + 2 = 0$ has a solution:

(a) $\frac{1}{2}$

(b) -2

(c) 0

(d) -3

Answers and Explanations

1. **Answer: a**
   Matches $ax^{2n} + bx^n + c = 0$ with $n = 2$ (PDF p.216).

2. **Answer: b**
   $x^4 = (x^2)^2$, so $x^2 = y$ reduces to $y^2 - 6y + 8 = 0$ (PDF p.216).

3. **Answer: a**
   $x^3 = 1, 8 \implies x = 1, 2$ are real roots (PDF p.217).

4. **Answer: b**
   $x^{-1} = \frac{1}{x} = y \implies y^2 - 3y - 10 = 0$ (PDF p.217).

5. **Answer: a**
   $1 + 4 = 2 + 3 = 5$, satisfying Type II condition (PDF p.220).

6. **Answer: a**
   Correct solution set from pairing and solving (PDF p.222).

7. **Answer: b**
   $2^x = y \implies 8y^2 - 9y + 1 = 0$ (PDF p.228).

8. **Answer: a**
   $y = 4, 16 \implies x = 2, 4$ (PDF p.229).

9. **Answer: d**
   Symmetric coefficients indicate reciprocal equation (PDF p.216).

10. **Answer: b**
    Divide by x^2, use $x + \frac{1}{x} = y$ (PDF p.237).

11. **Answer: a**
    $x + \frac{1}{x} = 4 \implies x = 2 \pm \sqrt{3}$ (PDF p.231).

12. **Answer: b**
    Group $x + \frac{1}{x}$, use $x + \frac{1}{x} = y$ (PDF p.232).

13. **Answer: a**
    Correct solution set from reciprocal equation (PDF p.236).

14. **Answer: a**
    $y = 8, 16 \implies x = 3, 4$ (PDF p.230).

15. **Answer: a**
    Pairing $(2x - 7)(x + 3)$ and $(x - 3)(2x + 5)$, use $2x^2 - x = y$ (PDF p.225).

16. **Answer: a**
    $x + \frac{1}{x} = -4 \implies x = -2 \pm \sqrt{3}$ (PDF p.233).

17. **Answer: a**
    Group $x^2 + \frac{1}{x^2}$, use $x^2 + \frac{1}{x^2} = y$ (PDF p.239).

18. **Answer: a**
    $y = 9, 27 \implies x = 2, 3$ (PDF p.230).

19. **Answer: a**
    $x = -6$ is a real root (PDF p.224).

20. **Answer: a**
    $x = \frac{1}{2}$ is a solution (PDF p.235).