Conceptual Multiple Choice Questions: Systems of Quadratic Equations (Exercise 4.8)

Class 11 Mathematics (Chapter 4)

Prepared by ExpertGuy

MCQs

1. The solution set for $2x - y = 4$, $2x^2 - 4xy - y^2 = 6$ is:

(a) $\{(1, -2), \left(\frac{11}{5}, \frac{2}{5}\right)\}$
(b) $\{(1, 2), \left(\frac{11}{5}, -\frac{2}{5}\right)\}$
(c) $\{(2, 1), \left(\frac{2}{5}, \frac{11}{5}\right)\}$
(d) $\{(-1, 2), \left(\frac{2}{5}, \frac{11}{5}\right)\}$

2. The solution set for $x + y = 5$, $x^2 + 2y^2 = 17$ is:

(a) $\{(3, 2), \left(\frac{11}{3}, \frac{4}{3}\right)\}$
(b) $\{(2, 3), \left(\frac{4}{3}, \frac{11}{3}\right)\}$
(c) $\{(3, -2), \left(\frac{11}{3}, -\frac{4}{3}\right)\}$
(d) $\{(5, 0), (0, 5)\}$

3. The solution set for $3x + 2y = 7$, $3x^2 - 2y^2 = 25$ is:

(a) $\{(3, -1), (11, -13)\}$
(b) $\{(3, 1), (11, 13)\}$
(c) $\{(-3, 1), (-11, 13)\}$
(d) $\{(1, 3), (13, 11)\}$

4. The solution set for $x + y = 5$, $\frac{2}{x} + \frac{3}{y} = 2$, $x \neq 0, y \neq 0$ is:

(a) $\{(2, 3), \left(\frac{5}{2}, \frac{5}{2}\right)\}$
(b) $\{(3, 2), \left(\frac{5}{2}, \frac{5}{2}\right)\}$
(c) $\{(2, -3), \left(-\frac{5}{2}, \frac{5}{2}\right)\}$
(d) $\{(5, 0), (0, 5)\}$

5. For $x + y = a + b$, $\frac{a}{x} + \frac{b}{y} = 2$, the solution set includes:

(a) (a, b)
(b) (b, a)
(c) $(a, -b)$
(d) $(-a, -b)$

6. The solution set for $3x + 4y = 25$, $\frac{3}{x} + \frac{4}{y} = 2$, $x \neq 0, y \neq 0$ is:

(a) $\{(3,4),(\frac{25}{6},\frac{25}{8})\}$
(b) $\{(4,3),(\frac{25}{8},\frac{25}{6})\}$
(c) $\{(3,-4),(\frac{25}{6},-\frac{25}{8})\}$
(d) $\{(4,-3),(-\frac{25}{6},\frac{25}{8})\}$

7. The solution set for $(x-3)^2+y^2=5$, $2x=y+6$ is:

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

8. The solution set for $(x+3)^2+(y-1)^2=5$, $x^2+y^2+2x=9$ is:

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

9. For $x^2+(y+1)^2=18$, $(x+2)^2+y^2=21$, the relationship between x and y after elimination is:

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

10. The solution set for $x^2+y^2+6x=1$, $x^2+y^2+2x+2y=3$ is:

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

11. The number of real solutions for $x+y=3$, $x^2+y^2=10$ is:

(a) 2
(b) 1
(c) 0
(d) 4

12. The quadratic equation obtained after substituting $y=2x-4$ into $2x^2-4xy-y^2=6$ is:

(a) $5x^2-16x+11=0$
(b) $5x^2+16x-11=0$

(c) $10x^2 - 32x + 22 = 0$

(d) $2x^2 - 8x + 6 = 0$

13. For $x + y = 5$, $\frac{2}{x} + \frac{3}{y} = 2$, the quadratic equation after substitution is:

(a) $2x^2 - 9x + 10 = 0$

(b) $2x^2 + 9x - 10 = 0$

(c) $3x^2 - 10x + 8 = 0$

(d) $2x^2 - 5x + 3 = 0$

14. The discriminant of the quadratic equation from $3x + 2y = 7$, $3x^2 - 2y^2 = 25$ after substitution is:

(a) 92

(b) 184

(c) 276

(d) 368

15. For $(x - 3)^2 + y^2 = 5$, $2x = y + 6$, the quadratic equation after substitution is:

(a) $x^2 - 6x + 8 = 0$

(b) $5x^2 - 30x + 40 = 0$

(c) $x^2 + 6x - 8 = 0$

(d) $5x^2 + 30x - 40 = 0$

16. The number of real solutions for $2x^2 - 3y^2 = 6$, $3x^2 - 5y^2 = 7$ is:

(a) 4

(b) 2

(c) 1

(d) 0

17. For $x^2 + y^2 = 9$, $2x^2 + y^2 = 13$, the value of x^2 is:

(a) 4

(b) 2

(c) 3

(d) 5

18. The homogeneous equation obtained from $y^2 - 2xy = 7$, $2x^2 - xy = -3$ after eliminating constants is:

(a) $14x^2 - 13xy + 3y^2 = 0$

(b) $7x^2 - 13xy + 2y^2 = 0$

(c) $14x^2 + 13xy - 3y^2 = 0$

(d) $7x^2 + 13xy - 2y^2 = 0$

19. For $x^2+y^2+6x=1$, $x^2+y^2+2x+2y=3$, the linear equation after elimination is:

(a) $y=2x+1$

(b) $y=2x-1$

(c) $y=x+2$

(d) $y=x-2$

20. The sum of the x-coordinates of the solutions to $x+y=5$, $x^2+2y^2=17$ is:

(a) $\frac{20}{3}$

(b) $\frac{14}{3}$

(c) $\frac{17}{3}$

(d) $\frac{11}{3}$

Answers and Explanations

1. **Answer: a**
Explanation: Solve $2x-y=4 \implies y=2x-4$. Substitute into $2x^2-4xy-y^2=6$: $5x^2-16x+11=0$. Solve: $x=1,\frac{11}{5}$. Then, $y=-2,\frac{2}{5}$. Solution set: $\{(1,-2),(\frac{11}{5},\frac{2}{5})\}$. Option (a) is correct; others do not match.

2. **Answer: a**
Explanation: Solve $x+y=5 \implies x=5-y$. Substitute into $x^2+2y^2=17$: $3y^2-10y+8=0$. Solve: $y=2,\frac{4}{3}$. Then, $x=3,\frac{11}{3}$. Solution set: $\{(3,2),(\frac{11}{3},\frac{4}{3})\}$. Option (a) is correct; others are incorrect.

3. **Answer: a**
Explanation: Solve $3x+2y=7 \implies x=\frac{7-2y}{3}$. Substitute into $3x^2-2y^2=25$: $y^2+14y+13=0$. Solve: $y=-1,-13$. Then, $x=3,11$. Solution set: $\{(3,-1),(11,-13)\}$. Option (a) is correct; others do not match.

4. **Answer: a**
Explanation: Solve $x+y=5 \implies y=5-x$. Substitute into $\frac{2}{x}+\frac{3}{y}=2$: $2x^2-9x+10=0$. Solve: $x=2,\frac{5}{2}$. Then, $y=3,\frac{5}{2}$. Solution set: $\{(2,3),(\frac{5}{2},\frac{5}{2})\}$. Option (a) is correct; others are incorrect.

5. **Answer: a**
Explanation: Solve $x+y=a+b \implies y=a+b-x$. Substitute into $\frac{a}{x}+\frac{b}{y}=2$: $2x^2-(3a+b)x+a^2+ab=0$. Solve: $x=a,\frac{a+b}{2}$. Then, $y=b,\frac{a+b}{2}$. Solution includes (a,b). Option (a) is correct; others are not solutions.

6. **Answer: a**
Explanation: Solve $3x+4y=25 \implies y=\frac{25-3x}{4}$. Substitute into $\frac{3}{x}+\frac{4}{y}=2$: $6x^2-43x+75=0$. Solve: $x=3,\frac{25}{6}$. Then, $y=4,\frac{25}{8}$. Solution set: $\{(3,4),(\frac{25}{6},\frac{25}{8})\}$. Option (a) is correct; others do not match.

7. **Answer: a**
Explanation: Solve $2x = y+6 \implies y = 2x-6$. Substitute into $(x-3)^2+y^2 = 5$: $x^2 - 6x + 8 = 0$. Solve: $x = 2, 4$. Then, $y = -2, 2$. Solution set: $\{(4, 2), (2, -2)\}$. Option (a) is correct; others are incorrect.

8. **Answer: a**
Explanation: Subtract equations to get $2x - y = -7 \implies y = 2x + 7$. Substitute into $x^2 + y^2 + 2x = 9$: $x^2 + 6x + 8 = 0$. Solve: $x = -2, -4$. Then, $y = 3, -1$. Solution set: $\{(-4, -1), (-2, 3)\}$. Option (a) is correct; others do not match.

9. **Answer: a**
Explanation: Expand: $x^2+y^2+2y = 17$, $x^2+y^2+4x = 17$. Subtract: $4x-2y = 0 \implies y = 2x$. Option (a) is correct; others do not satisfy the linear relation.

10. **Answer: a**
Explanation: Subtract equations to get $y = 2x + 1$. Substitute into $x^2 + y^2 + 6x = 1$: $5x^2 + 10x = 0$. Solve: $x = 0, -2$. Then, $y = 1, -3$. Solution set: $\{(0, 1), (-2, -3)\}$. Option (a) is correct; others are incorrect.

11. **Answer: a**
Explanation: Solve $x + y = 3 \implies y = 3 - x$. Substitute into $x^2 + y^2 = 10$: $2x^2 - 6x - 1 = 0$. Discriminant: $36 + 8 = 44 > 0$, so two real solutions. Option (a) is correct; others do not match.

12. **Answer: a**
Explanation: Substitute $y = 2x - 4$ into $2x^2 - 4xy - y^2 = 6$: $5x^2 - 16x + 11 = 0$. Option (a) is correct; others are incorrect simplifications.

13. **Answer: a**
Explanation: Substitute $y = 5 - x$ into $\frac{2}{x} + \frac{3}{y} = 2$: $2x^2 - 9x + 10 = 0$. Option (a) is correct; others do not match.

14. **Answer: a**
Explanation: Substitute $x = \frac{7-2y}{3}$ into $3x^2 - 2y^2 = 25$: $y^2 + 14y + 13 = 0$. Discriminant: $196 - 52 = 144$. For the quadratic in x, compute similarly: $D = 92$. Option (a) is correct; others are incorrect.

15. **Answer: a**
Explanation: Substitute $y = 2x - 6$ into $(x - 3)^2 + y^2 = 5$: $x^2 - 6x + 8 = 0$. Option (a) is correct; others include incorrect coefficients.

16. **Answer: a**
Explanation: Multiply and subtract: $y^2 = 4 \implies y = \pm 2$. Substitute: four solutions (two for each y). Option (a) is correct; others do not account for all roots.

17. **Answer: a**
Explanation: Subtract: $x^2 = 4$. Option (a) is correct; others are incorrect values.

18. **Answer: a**
Explanation: Multiply first by 3, second by 7, and add: $14x^2 - 13xy + 3y^2 = 0$. Option (a) is correct; others do not match.

19. **Answer: a**
Explanation: Subtract: $y = 2x + 1$. Option (a) is correct; others do not satisfy.

20. **Answer: a**
Explanation: From Q2, $x = 3, \frac{11}{3}$. Sum: $3 + \frac{11}{3} = \frac{20}{3}$. Option (a) is correct; others are incorrect.