REV-QE-2324-ASM-SET 1-MATH
Suggested solutions

Multiple Choice Questions

1. C	2. C	3. C	4. C	5. C
6. D	7. C	8. C	9. C	10. D
11. A	12. D	13. C	14. B	15. C
16. C	17. C	18. C	19. C	20. A
21. C	22. D	23. D	24. C	25. A
26. C	27. B	28. B	29. A	30. D

1. C

$(x-k)^2 = 4k^2$

$x - k = \pm 2k$

$x = -k \quad \text{or} \quad 3k$

2. C

$x + 2 = 0 \quad \text{or} \quad 5x - 2 = 2$

$x = -2 \quad \text{or} \quad x = \frac{4}{5}$

3. C

$(x+4)^2 = 9$

$x + 4 = \pm 3$

$x = -1 \quad \text{or} \quad -7$

4. C

$2x(3x-1) = (2-3x)(3x-1)$

$2x = 2 - 3x \quad \text{or} \quad 3x - 1 = 0$

$x = \frac{2}{5} \quad \text{or} \quad x = \frac{1}{3}$

5. C

$3x^2 = 9x$

$3x(x-3) = 0$

$x = 0 \quad \text{or} \quad 3$

6. D

The equation holds for $x = k$.

When $x = k - 1$,

$$(x-1)(x-2) = (k-2)(k-3)$$
$$\neq (k-1)(k-2)$$

When $x = 3 - k$,

$$(x-1)(x-2) = (2-k)(1-k)$$
$$= (k-1)(k-2)$$

Thus, $x = k$ or $3 - k$.

7. C

$$(x-a)^2 = 9a^2$$
$$x - a = 3a \quad \text{or} \quad x - a = -3a$$
$$x = 4a \quad \text{or} \quad x = -2a$$

8. C

$$x - 3 = 2x + 1 \quad \text{or} \quad x = 0$$
$$x = -4 \quad \text{or} \quad x = 0$$

9. C

$$\frac{2x-1}{3x+2} = \frac{2-x}{x+2}$$
$$(2x-1)(x+2) = (2-x)(3x+2)$$
$$5x^2 - x - 6 = 0$$
$$x = \frac{6}{5} \quad \text{or} -1$$

10. D

$$3x - 2x^2 - 1 = 0$$
$$-2x^2 + 3x - 1 = 0$$
$$x = \frac{1}{2} \quad \text{or} \quad 1$$

11. A

β is a root.

$$4\beta^2 - 5\beta - 1 = 0$$
$$4\beta^2 - 5\beta = 1$$
$$7 + 10\beta - 8\beta^2 = 7 - 2(4\beta^2 - 5\beta)$$
$$= 7 - 2(1)$$
$$= 5$$

12. D

We have $3\alpha^2 - 4\alpha - 2 = 0$.

$$\begin{aligned} 9 + 12\alpha - 9\alpha^2 &= 9 - 3(3\alpha^2 - 4\alpha) \\ &= 9 - 3(0 + 2) \\ &= 3 \end{aligned}$$

13. C

x-intercepts are -2 and $6 \quad \Rightarrow \quad f(x) = A(x + 2)(x - 6)$ for some constant A.

$$\begin{aligned} f(0) = -6 &= A(2)(-6) \\ A &= \frac{1}{2} \end{aligned}$$

$$f(x) = \frac{1}{2}(x + 2)(x - 6) = \frac{1}{2}(x^2 - 4x + 12)$$

14. B

$c = 6$.

$$\begin{aligned} 0 &= (3)^2 + b(3) + 6 \\ b &= -5 \end{aligned}$$

15. C

x-intercepts of the graph are -4 and -1.

The equation of the graph is $y = a(x + 1)(x + 4)$, where a is a constant.

$$\begin{aligned} -8 &= a(0 + 1)(0 + 4) \\ a &= -2 \end{aligned}$$

Required equation is $y = -2(x + 1)(x + 4)$.

16. C

$$0 = x(5x - 1) + 3 - x^2$$

$$0 = 4x^2 - x + 3$$

$\Delta = 1^2 - 4(4)(3) = -47 < 0$

The equation has no real roots.

Thus, the graph has 0 x-intercept.

17. C

We have

$$\begin{cases} \alpha - \beta = 2 \\ \alpha + \beta = 3 \end{cases}$$

Solving, we have $\alpha = \frac{5}{2}$ and $\beta = \frac{1}{2}$.

$$\alpha\beta = \frac{m}{3}$$
$$\frac{5}{4} = \frac{m}{3}$$
$$m = \frac{15}{4}$$

18. C

$$\frac{4}{a} = \frac{2}{3}$$
$$a = 6$$

19. C

$$\alpha^2 + \beta^2 = 11$$
$$(\alpha + \beta)^2 - 2\alpha\beta = 11$$
$$(4)^2 - 2(m) = 11$$
$$m = \frac{5}{2}$$

20. A

$$-4 = -\frac{-(2a + 3b)}{a}$$
$$\frac{b}{a} = -2$$

Product of roots $= -\frac{b}{a} = 2$

21. C

a and b are roots of the equation $x^2 + 4x + 1 = 0$.

$a + b = -4$ and $ab = 1$.

$$a^2 + b^2 = (a + b)^2 - 2ab$$
$$= (-4)^2 - 2(1)$$
$$= 14$$

22. D

α and β are roots of $x^2 = 3x - 4$, i.e., $x^2 - 3x + 4 = 0$.

$\alpha^2\beta^2 = (\alpha\beta)^2 = 4^2 = 16$

23. D

α and β are roots of the equation $x^2 + px + 2p = 0$.

$\alpha + \beta = -p$ and $\alpha\beta = 2p$.

$$\begin{aligned}\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} &= \frac{\alpha^3 + \beta^3}{\alpha\beta} \\ &= \frac{(\alpha + \beta)[(\alpha + \beta)^2 - 3\alpha\beta]}{\alpha\beta} \\ &= \frac{-p(p^2 - 6p)}{2p} \\ &= \frac{-p^2 + 6p}{2}\end{aligned}$$

24. C

α and β are roots of the equation $x^2 = 4x + 3$, i.e., $x^2 - 4x - 3 = 0$.

$\alpha + \beta = 4$ and $\alpha\beta = -3$.

$$\begin{aligned}(\alpha + 1)(\beta + 1) &= \alpha\beta + (\alpha + \beta) + 1 \\ &= -3 + 4 + 1 \\ &= 2\end{aligned}$$

25. A

$$\begin{aligned}\beta^2 - 2\beta + k &= 0 \\ \beta^2 &= 2\beta - k \\ 2\alpha + \beta^2 &= 2\alpha + (2\beta - k) \\ &= 2(\alpha + \beta) - k \\ &= 2(2) - k \\ &= 4 - k\end{aligned}$$

26. C

Let the smaller number be x.

$$\begin{aligned}x^2 + (x + 6)^2 &= 30x + 140 \\ 2x^2 - 18x - 104 &= 0 \\ x &= 13 \quad \text{or} \quad -4 \text{ (rejected)}\end{aligned}$$

Sum of two numbers = $13 + (13 + 6) = 32$

27. B

Sum of roots = $2\alpha + 2\beta = 2(-6) = -12$

Product of roots = $4\alpha\beta = 4(-3) = -12$

Required equation is $x^2 + 12x - 12 = 0$.

28. B

$\alpha + \beta = \frac{3}{2}$ and $\alpha\beta = \frac{7}{2}$.

$$(\alpha - 3) + (\beta - 3) = (\alpha + \beta) - 6$$
$$= -\frac{9}{2}$$

$$(\alpha - 3)(\beta - 3) = \alpha\beta - 3(\alpha + \beta) + 9$$
$$= 8$$

Required equation is

$$x^2 + \frac{9}{2}x + 8 = 0$$
$$2x^2 + 9x + 16 = 0$$

29. A

$$(\alpha + 1)(\beta + 1) = 3$$
$$\alpha\beta + (\alpha + \beta) + 1 = 3$$
$$\alpha\beta = -2$$

Required equation is $x^2 - 4x - 2 = 0$.

30. D

$\alpha + \beta = 3$ and $\alpha\beta = 2$.

$$(\alpha - 5) + (\beta - 5) = (\alpha + \beta) - 10$$
$$= -7$$

$$(\alpha - 5)(\beta - 5) = \alpha\beta - 5(\alpha + \beta) + 25$$
$$= 12$$

Required equation is $x^2 + 7x + 12 = 0$.

END OF PAPER