REG-INEQ-2223-ASM-SET 2-MATH
Suggested solutions

Multiple Choice Questions

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

1. A

$2x^2 - 3x - 20 \leq 0$

$$-\frac{5}{2} \leq x \leq 4$$

2. C

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

$\Delta = 4^2 - 4(-4)(-3) = -32 < 0$

Since the coefficient of x^2 is negative, the inequality has no solutions.

3. D

$6x^2 - x - 12 > 0$

$$x < -\frac{4}{3} \quad \text{or} \quad x > \frac{3}{2}$$

Required value is 2.

4. D

$$4(2x + 1) < 3x(2x + 1)$$

$(2x + 1)(4 - 3x) < 0$

$$x < -\frac{1}{2} \quad \text{or} \quad x > \frac{4}{3}$$

5. D

$(2x - 3)^2 - 5(2x - 3) + 6 \geq 0$

$$2x - 3 \leq 2 \quad \text{or} \quad 2x - 3 \geq 3$$

$$x \leq \frac{5}{2} \quad \text{or} \quad x \geq 3$$

6. B

$x^2 - 11x + 24 < 0$ or $2x - 1 \leq 9$

$3 < x < 8$ $x \leq 5$

Thus, we have $x < 8$.

7. C

$ax^2 + bx + c \leq 0$

$y \leq 0$

Thus, we have $x \leq -4$ or $x \geq 1$.

8. A

$(x - 3)(x + 2) \leq x(x + 2)$

$0 \leq (x + 2)[x - (x - 3)]$

$0 \leq 3(x + 2)$

$x \geq -2$

9. A

Required solution is the part of the curve below or on the x-axis.

Thus, $x = 3$.

10. C

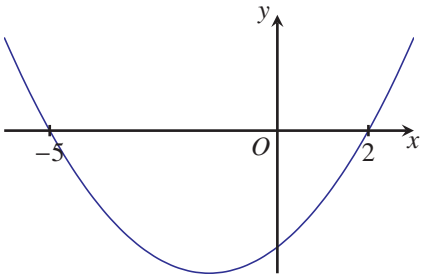
$ax^2 + bx + c \leq 0$

$y \leq 0$

Thus, x can be any real number.

11. A

The figure below shows the graph of $y = (x - 2)(x + 5)$.



Required solution is the range of values of x for the part of the curve above the x-axis.

Required range is $x < -5$ or $x > 2$.

12. D

$(3x + 1)(x - 4) < 0$

$-\frac{1}{3} < x < 4$

13. A

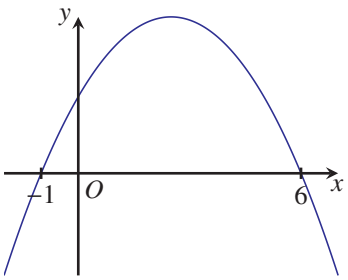
$x^2 - 1 > 0$

$x < -1 \quad \text{or} \quad x > 1$

Domain of $f(x)$ is $x < -1$ or $x > 1$.

14. A

The figure below shows the graph of $y = -x^2 + 5x + 6$.



Required solution is the range of values of x for the part of the curve below the x-axis.

Required range is $x < -1$ or $x > 6$.

15. C

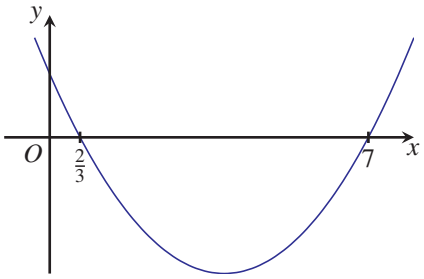
$(2x + 3)^2 + 20 \geq 0$

$y \geq 0$

Thus, the solutions are all real values of x.

16. C

The figure below shows the graph of $y = 3x^2 - 23x + 14$.



Required solution is the range of values of x for the part of the curve below the x-axis.

Required range is $\frac{2}{3} < x < 7$.

17. B

For equation $x^2 - 4x + 5 = 0$,

$\Delta = 4^2 - 4(1)(5) = -4 < 0$

Since the coefficient of $x^2 > 0$, x can be any real number.

18. A

$-2x^2 + 11x + 6 \leq 0$

$x \leq -\frac{1}{2} \quad \text{or} \quad x \geq 6$

19. B

$2(x-2)^2 - 98 \geq 0$

$2x^2 - 8x - 90 \geq 0$

$x \leq -5 \quad \text{or} \quad x \geq 9$

20. D

Note that $y \geq 0$ for all real values of x.

Thus, the inequality $ax^2 + bx + c < 0$ has no solutions.

21. C

$6x^2 - 19x - 7 < 0 \quad \text{and} \quad -4x + 1 < -1$

$-\frac{1}{3} < x < \frac{7}{2} \qquad x > \frac{1}{2}$

Thus, we have $\frac{1}{2} < x < \frac{7}{2}$.

22. A

$\pi^{2x} - 9\pi^x + 20 < 2$

$(\pi^x)^2 - 9\pi^x + 18 < 0$

$3 < \pi^x < 6$

$\log 3 < x \log \pi < \log 6$

$\frac{\log 3}{\log \pi} < x < \frac{\log 6}{\log \pi}$

$\log_\pi 3 < x < \log_\pi 6$

23. A

Let the other root of the equation $x^2 - 3x + c = 0$ be β.

$-2 + \beta = -\frac{(-3)}{1}$

$\beta = 5$

Required range is $-2 < x < 5$.

24. C

c and 4 are roots of the equation $x^2 - ax + 12 = 0$.

$(c)(4) = \frac{12}{1} \quad \text{and} \quad c + 4 = \frac{a}{1}$

$c = 3 \qquad a = 7$

25. B

The equation $x^2 + (4 - k)x + k - 1 = 0$ has no real roots.

$$(4 - k)^2 - 4(1)(k - 1) < 0$$
$$k^2 - 12k + 20 < 0$$
$$2 < k < 10$$

26. A

$$\Delta = (2k)^2 - 4(4)(4k - 7) \geq 0$$
$$4k^2 - 64k + 112 \geq 0$$
$$k \leq 2 \quad \text{or} \quad k \geq 14$$

27. D

$$\Delta = (3k - 5)^2 - 4(1)(3k + 10) > 0$$
$$9k^2 - 42k - 15 > 0$$
$$k < -\frac{1}{3} \quad \text{or} \quad k > 5$$

28. D

$$4x - 1 = x^2 + kx + 8$$
$$0 = x^2 + (k - 4)x + 9$$

The curve intersects the straight line $y = 4x - 1$ at two different points.

$$\Delta = (k - 4)^2 - 4(1)(9) > 0$$
$$k^2 - 8k - 20 > 0$$
$$k < -2 \quad \text{or} \quad k > 10$$

29. C

$$mx - 2 = 2x^2 + 15x + 6$$
$$0 = 2x^2 + (15 - m)x + 8$$

The curve and the line intersect at two points.

$$\Delta = (15 - m)^2 - 4(2)(8) > 0$$
$$m^2 - 30m + 161 > 0$$
$$m < 7 \quad \text{or} \quad m > 23$$

30. B

The equation $x^2 + kx + k + 3 = 0$ has no real roots.

$$\Delta = k^2 - 4(1)(k + 3) < 0$$
$$k^2 - 4k - 12 < 0$$
$$-2 < k < 6$$

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