

1. Find the solution set of the following Inequalities, in interval notation:

(a) $1 < |x + 1| < 2$

(b) $|2x + 1| + \frac{2}{3} \geq \frac{11}{3}$

(c) $\frac{(x-2)^5(x^2+1)(x-3)^2}{(4-x)^3} \leq 0$

(d) $|x - 1| \geq 3|x - 2|$

(e) $x^2 + x + 2 < 0$

(f) $|x|^2 + |x| \geq 2$

(g) $|2x + 8|^2 - |9x + 36| \geq 9$

(h) $\frac{x^2+10x+25}{x+1} \geq 0$

(i) $\frac{5}{x} \geq \frac{4}{x-2}$

(j) $\frac{1}{x} \leq x$

2. If the point (a, b) is in the first quadrant and the point (c, d) is in the third quadrant, then the point (ac, bd) is in which quadrant?

3. Which one of the following statements is TRUE?

(a) The y-intercept of the line $3x - 4y = -20$ is -5 .

(b) The line $6y = -5x$ does not pass through the origin.

(c) The midpoint of $(2a + 1, 2b - 1)$ and $(1, -1)$ is (a, b)

(d) The slope of a horizontal line is undefined.

(e) The points $(-2, 6), (8, 0), (18, -6)$ lie on the same line.

4. If the discriminant of the quadratic equation $x^2 + 4kx - 5 = x$ is 29, then find the value(s) of k .

5. If the shorter sides of a right triangle have lengths K and $2K + 2$ and if the hypotenuse has length $K + 8$, then find the value of $3K + 1$.

6. If one of the x-intercepts of the graph of the function $f(x) = 3x^2 + kx - 4$ is 4, then find the other x-intercept.

7. Find the Domain and the Range of the function $y = |x + 2| - 1$.

8. If the product of two consecutive odd positive integers is 195, then find these two numbers.

9. The length L of a rectangle is 3 feet less than twice its width. If the perimeter of the rectangle is 174 feet, then find the length L .

10. If a point (a, b) lies in Quadrant II, then the point $(4, ab)$ lies in which quadrant.

11. The sum of the length and the width of a rectangle is $\frac{9}{2}$ cm. Find the length and the width if the area of the rectangle is 5 sq. cm
12. If $m < n$, solve the inequality for x $|m + n - 2x| < n - m$
13. If the line $(b^2 - 1)x + (b + 1)y = b$ is perpendicular to the line $x + 2y = 1$, then find the value of b .
14. Let $g(x) = [x]$, where $[x]$ is the greatest integer function. Find the value of $\frac{g(x-a)+g(a-x)}{g(\frac{x}{a})}$ where $x = 1.5$ and $a = 0.6$.
15. If $M(p, q)$ is the midpoint of the line joining $A(1, -2)$ and $B(-3, 1)$, then find the slope of the line joining $M(p, q)$ and $C(1, 1)$.
16. Find the Domain of $f(x) = \frac{\sqrt{3-x}}{\sqrt{x-2}} + 3$.
17. The length L of a rectangular field is twice its width. Suppose that the area of the field is at least 1800 square feet. Find all possible values of L .
18. Which one of the following relations is NOT a function?
 - (a) $K = \{(x, y) \mid |x| = y^2 + 2\}$
 - (b) $H = \{(x, y) \mid y = x^2 + 3\}$
 - (c) $R = \{(x, y) \mid y = \sqrt{x-1}\}$
 - (d) $W = \{(x, y) \mid y = |x-3|\}$
 - (e) $U = \{(1, 3), (2, 3), (3, 3), (4, 3)\}$
19. If $f(x) = [2x + 1]$, where $[y]$ denotes the greatest integer less than or equal to y , then find the value of $f(-3.2) + f(\sqrt{2})$.
20. Find the equation of the straight line which passes through the x-intercept and the y-intercept of the graph of the function $f(x) = \begin{cases} 3x + 6, & \text{if } 0 \leq x \leq 4 \\ 2 - \frac{x}{4}, & \text{if } x > 4 \end{cases}$
21. Find the equation of the line whose slope does not exist and which passes through the point $(-1, 3)$.
22. If $(2, 3)$, $(4, 2)$ and $(x, 0)$ are three points lying on a straight line, then find the value of x .
23. The cost C for x students to eat in a cafeteria for one day is given by $C = x^2 - 10x + 125$. If the cost is 500 riyals, then find the number of students.
24. Let $f(x) = [3x + 5]$, where $[]$ denotes the greatest integer function. Find the set of all values of x for which $f(x) = -2$.
25. If $f(x) = \begin{cases} x^3 - 4x, & \text{if } x < 2 \\ [\frac{4}{3}x - 3], & \text{if } x \geq 2 \end{cases}$, where $[]$ is the greatest integer function, then find the value of $f(-1) + f(4)$.

26. If the line $kx + 3y - 1 = 0$ is perpendicular to the line $3x + (k - 4)y + 5 = 0$, then find the value of the real number k .
27. Let $y = \left[\frac{1}{2} - 2x \right]$, where $[\]$ represents the greatest integer function. If $y = -4$, then find the set of all possible values of x .
28. Find the x- and y-intercepts of the graph of $f(x) = \begin{cases} 3x + 4, & \text{if } x < -1 \\ 1 - x, & \text{if } x \geq -1 \end{cases}$.
29. For a real number c , if the equation $x^2 - 2x + c = 0$ has two distinct solutions, one of which is twice the other, then find the value of c .
30. Find the domain of the function $f(x) = \sqrt{-x^2 - 25}$
31. If $f(x) = \sqrt{x^2 + 2x + 1}$ with $-2 < x < -1$, then find $\frac{f(x-2)}{x-1}$.
32. Find the value of k in interval notation for which the function $y = kx^2 - 8x + 4$ has no x-intercept.
33. Graph the set of points (x, y) for which $|x + 4| \leq 1$ and $0 \leq y + 2 \leq 1$.
34. Find the largest possible value of $\sqrt{-3x^2 - 2x - 1}$
35. The equation $x^2 - 8x + y^2 + 10y = -41$ represents: 1) a circle 2) no graph 3) a straight line 4) a point
36. Find the Domain and the Range of $f(x) = -\sqrt{16 - x^2}$
37. Graph $|x| + |y| = 2$.
38. Find the point(s) of intersection of the two lines (if any): $3x - 4y = 2$ and $4x + 3y = 4$.
39. Is 6 in the range of the function $f(x) = -x^2 + 4x + 1$.
40. Find the equation of the circle whose Center is the vertex of the quadratic equation: $F(x) = x^2 - 6x$, and passes through the point $(0, -2)$.
41. The height of a projectile is given by $h(t) = -16t^2 + 64t + 80$, Find the following:
- The maximum height of the projectile
 - The time t when the projectile at maximum.
 - The time t when the projectile hit the ground.
42. Use the graph of $f(x) = |x| - 1$ to sketch the graph of the following functions:
- $g(x) = -f(x) + 2$
 - $h(x) = f(x + 2) - 1$

(c) $k(x) = f(-3x)$

43. If $x = 3$ is the axis of symmetry of the parabola $f(x) = -x^2 + 2cx + c^2 + 4$ for some constant c , then find the value of c and the maximum value of $f(x)$.