Sample Test 1

This list of sample test questions is subject to updates until we review for the test
Last update: Thursday, September 24, 2020

1. Determine the quadrant in which $(-2, -4)$ lies.
2. Find the intercepts of $y = (x - 3)(x + 1)$.
3. Find the intercepts of $y = x^2 - 3x + 2$.
4. Find the equation of the line passing through $(1, 2)$ and $(2, 5)$. Write your answer in slope-intercept form.
5. Find the slope of the line $y = 3$.
6. Find the slope of the line $x = 2$.
7. Find the equation of the line passing through $(5, 2)$, perpendicular to the line given by $y = 3/2 \cdot x - 2$.
8. Find the slope and the y-intercept of the line $2x - 3y = 6$.
9. Sandy rents a shop to sell cookies for 800 dollars per month. It costs her 0.50 dollars to produce a cookie which she sells for 3 dollars each. Write down the cost function, the revenue function, and calculate how many cookies does she have to sell in a month to break even?
10. Write the inequality $x \leq 2.5$ in interval notation.
11. Solve the linear inequality $2x - 1 < 3x + 2$.
12. Solve the inequality $\left|\frac{2x-3}{3}\right| \geq 5$. Write your answer in interval notation.
13. Solve the inequality $(x - 1)x(x + 3) \geq 0$. Write your answer in interval notation.
14. Solve the inequality $x^2 - 8 < 1$. Write your answer using inequality notation.
15. Solve the inequality $x(x - 1)(x + 2) > 0$. Write your answer in interval notation.
16. Solve the inequality $x^2 - 50 \leq -1$. Write your answer in interval notation.
17. Solve the inequality $x^2 - 5x \geq -6$. Write your answer in interval notation.
18. Solve the inequality $\frac{x-7}{x+1} \geq 0$. Write your answer in interval notation.

19. Find the domain of $\sqrt{3x-4}$. Write your answer in interval notation.

20. Find the domain of $\frac{1}{\sqrt{3-x}}$. Write your answer in interval notation.

Solutions:

1. Q3.

2. To find the y intercept we substitute $x = 0$ and get $y = -3$. To find the x-intercepts we solve $0 = (x-3)(x+1)$ and get $x = 3$ or $x = -1$.

3. The right hand side can be factored as $(x-1)(x-2)$. To find the y intercept we substitute $x = 0$ and get $y = 2$. To find the x-intercepts we solve $0 = (x-1)(x-2)$ and get $x = 1$ or $x = 2$.

4. The slope is $m = \frac{5-2}{2-1} = 3$. The point-slope equation is $y-2 = 3(x-1)$. After rearranging we get $y = 3x - 1$.

5. 0.

6. undefined.

7. The slope of the line $y = 3/2 \cdot x - 2$ is $3/2$. The perpendicular slope is $-2/3$. The point slope equation is $y - 2 = -2/3 \cdot (x-5)$. After rearranging we get $y = -2/3 \cdot x + 16/3$.

8. Solving for y we get $2x - 6 = 3y$ and $2/3 \cdot x - 2 = y$. The slope is $2/3$, the y-intercept is -2.

9. The cost function is $C(x) = 800 + 0.5x$, the revenue function is $R(x) = 3x$. To find the break-even point we must solve the equation $800 + 0.5x = 3x$. We get $x = 320$.

10. $(-\infty, 2.5]$.

11. We get $2x - 3 < 3x$ and $-3 < x$.

12. The inequality is equivalent to

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

Multiplying by 3 gives

$$2x-3 \leq -15 \text{ or } 2x-3 \geq 15.$$

Add 3:

$$2x \leq -12 \text{ or } 2x \geq 18.$$

Divide by 2:

$$x \leq -6 \text{ or } 2x \geq 9.$$

The answer in interval notation is $(-\infty, -6] \cup [9, \infty)$.

13. The critical points are $x = -3$, $x = 0$ and $x = 1$. Using test points we see that the value of $(x-1)x(x+3)$ is negative for $x < -3$, positive for $-3 < x < 0$, negative for $0 < x < 1$, and positive for $1 < x$. The answer includes those values for x where $(x-1)x(x+3)$ is positive or zero.

The answer in interval notation is $[-3, 0] \cup [1, \infty)$.

14. We need 0 on one side so we subtract 1 on both sides and get $x^2 - 9 < 0$, that is, $(x-3)(x+3) < 0$. Following the steps in the previous solution we get the critical points -3 and 3 and that $(x-3)(x+3)$ is negative exactly when $-3 < x < 3$.

Another way to solve this is to add 8 to the original inequality and get $x^2 < 9$. This is equivalent to $|x| < 3$, which gives the same final answer.

15. The critical points are -2, 0, 1. Using test points or analyzing the signs of the factors we get that the left hand side is positive for $x > 1$ or $-2 < x < 0$. In interval notation this is the set $(-2, 0) \cup (1, \infty)$.

16. Adding 1 to both sides gives $x^2 - 49 \leq 0$. The left hand side can be factored as $(x-7)(x+7)$. The left hand side is negative or zero when $-7 \leq x \leq 7$. In interval notation this is $[-7, 7]$.

17. Adding 6 to both sides gives $x^2 - 5x + 6 \geq 0$. The left hand side can be factored as $(x - 2)(x - 3)$. The left hand side is positive or zero when $x \leq 2$ or $x \geq 3$. In interval notation this is $(-\infty, 2] \cup [3, \infty)$.

18. The critical points are 7 and -1. The left hand side is positive when $x > 7$ or $x < -1$, and it is zero at $x = 7$. It is not defined at $x = -1$. The solution is $x < -1$ or $x \geq 7$. In interval notation this is $(-\infty, -1) \cup [7, \infty)$.

19. We must solve the inequality $3x - 4 \geq 0$. The solution is $x \geq 4/3$. In interval notation we get $[3/4, \infty)$.

20. The square root is defined only for nonnegative numbers, but we also cannot divide by zero. We must solve the inequality $3 - x > 0$. The solution is $x < 3$, which is $(-\infty, -3)$ in interval notation.