## **Online Mathematics Preparedness Course** Quiz 2 – Solutions

1. Write the equation of a circle with center (0, -2) and a radius of 25

$$(x - h)^{2} + (y - k)^{2} = a^{2}$$
$$(x - 0)^{2} + (y - (-2))^{2} = 25^{2}$$
$$(x)^{2} + (y + 2)^{2} = 625$$

2. The domain of  $\frac{\sqrt{x}}{x^2-4}$  is

We have  $\sqrt{x}$ , the domain is  $[0, \infty)$ Let's check when the denominator would be zero by solving  $x^2 - 4 = 0$ . We get  $x^2 = 4 \rightarrow x = \pm 2$ . We then exclude these values from the domain. Domain of the function is  $[0,2) \cup (2,\infty)$ 

3. What is the point of intersection of y = -3x + 9 and y = 2x + 3-3x + 9 = 2x + 3-3x - 2x = 3 - 9-5x = -6 $x = \frac{6}{5}$  $y = 2x + 3 \rightarrow y = 2\left(\frac{6}{5}\right) + 3$  $y = \frac{12}{5} + 3$  $y = \frac{12}{5} + \frac{15}{5} = \frac{27}{5}$ 

Point of intersection is  $\left(\frac{6}{5}, \frac{27}{5}\right)$ 

4. Find k if the distance between (k, 0) and (0, 2k) is 10

$$(k - 0)^{2} + (0 - 2k)^{2} = 10^{2}$$
$$k^{2} + 4k^{2} = 100$$
$$5k^{2} = 100$$
$$k^{2} = \frac{100}{5}$$
$$k^{2} = 20$$
$$k = \pm\sqrt{20} = \pm 2\sqrt{5}$$

5. For all nonzero values of a, b, and c, find the intercepts of the line ax + by + c = 0Note that x-intercept is when y=0 and y-intercept is when x=0; you are not to assume any specific numerical values of a. b. and c.

Let x = 0, we get a(0) + by + c = 0

$$by = -c \to y = -\frac{c}{b}$$

Let y = 0, we get ax + b(0) + c = 0

$$ax = -c \rightarrow x = -\frac{c}{a}$$

We have  $(0, -\frac{c}{b})$  and  $(-\frac{c}{a}, 0)$ 

6. Is the given function even, odd, or neither:  $2x - x^2$  $f(-x) = 2(-x) - (-x)^2$   $-2x - x^2$   $f(-x) \neq f(x) \& f(-x) \neq -f(x)$ 

This function is neither even not odd

7. Describe the transformations (in words) that took place to convert  $f(x) = \sqrt{x}$  into

 $g(x) = -3\sqrt{x} - 1$ Reflection about x-axix Vertical stretch by a factor of 3 Vertical translation of 1 unit down

8. What is the domain and range of

$$f(x) = \frac{3x - |x|}{x}$$

We have  $|x| = \begin{cases} x & if \ x \ge 0 \\ -x & if \ x < 0 \end{cases}$ 

We must exclude x = 0 since that would make the denominator equal to 0.

$$If x > 0, f(x) = \frac{3x - x}{x} = \frac{2x}{x} = 2$$
  
$$If x < 0, f(x) = \frac{3x - (-x)}{x} = \frac{4x}{x} = 4$$

Domain is  $(-\infty, 0) \cup (0, \infty)$ , and range is y = 2, 4

9. Write the equation of a hyperbola with vertices at (2,5) and (6,5) and foci at (1,5) and (7,5) The given hyperbola is not centered at the origin, and the transverse axis is x-axis

$$\frac{(x-k)^2}{a^2} - \frac{(y-h)^2}{b^2} = 1$$

Vertex would be at the midpoint of the vertices at (4,5)

$$\frac{(x-4)^2}{a^2} - \frac{(y-5)^2}{b^2} = 1$$

Length of transverse axis (distance between two vertices)  $2a = |2 - 6| \rightarrow 2a = 4$ The coordinates of the foci are  $(h \pm c, k)$ . So (h - c, k) = (1,5) and (h + c, k) = (7,5)

$$c = 3$$
  

$$b^{2} = c^{2} - a^{2} = 3^{2} - 2^{2} = 5$$
  

$$\frac{(x-4)^{2}}{4} - \frac{(y-5)^{2}}{5} = 1$$

10. The domain of  $\frac{\sqrt{x^2-25}}{3x-24}$ 

Restriction on numerator is that  $x^2 - 25 \ge 0$ , which means that  $(x - 5)(x + 5) \ge 0 \rightarrow$  $(-\infty, -5) \cup (5, \infty)$ Restriction on denominator is  $3x - 24 \ne 0 \rightarrow x \ne 8$ Domain is  $(-\infty, -5) \cup (5, 8) \cup (8, \infty)$