## Online Mathematics Preparedness Course <br> Quiz 2 - Solutions

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

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

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 $y=-3 x+9$ and $y=2 x+3$

$$
\begin{gathered}
-3 x+9=2 x+3 \\
-3 x-2 x=3-9 \\
-5 x=-6 \\
x=\frac{6}{5} \\
y=2 x+3 \rightarrow y=2\left(\frac{6}{5}\right)+3 \\
y=\frac{12}{5}+3 \\
y=\frac{12}{5}+\frac{15}{5}=\frac{27}{5}
\end{gathered}
$$

Point of intersection is $\left(\frac{6}{5}, \frac{27}{5}\right)$
4. Find $k$ if the distance between $(k, 0)$ and $(0,2 k)$ is 10

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

5. For all nonzero values of $\mathrm{a}, \mathrm{b}$, and c , find the intercepts of the line $a x+b y+c=0$

Note 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 $a(0)+b y+c=0$

$$
b y=-c \rightarrow y=-\frac{c}{b}
$$

Let $y=0$, we get $a x+b(0)+c=0$

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

We have $\left(0,-\frac{c}{b}\right)$ and $\left(-\frac{c}{a}, 0\right)$
6. Is the given function even, odd, or neither: $2 x-x^{2}$

$$
\begin{gathered}
f(-x)=2(-x)-(-x)^{2} \\
-2 x-x^{2} \\
f(-x) \neq f(x) \& f(-x) \neq-f(x)
\end{gathered}
$$

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

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

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

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

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

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) $2 \mathrm{a}=|2-6| \rightarrow 2 a=4$
The coordinates of the foci are $(h \pm c, k)$. So $(h-c, k)=(1,5)$ and $(h+c, k)=(7,5)$

$$
c=3
$$

$$
\begin{gathered}
b^{2}=c^{2}-a^{2}=3^{2}-2^{2}=5 \\
\frac{(x-4)^{2}}{4}-\frac{(y-5)^{2}}{5}=1
\end{gathered}
$$

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

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

