Homework #23

First & Last Name: _____ **Class:** _____

For homework to be graded, it must be *fully completed*. This means you must **show your work**.

1. Translate the following limit equations using a complete sentence. Then draw a graph to represent each situation.

a. $\lim_{x\to -1^+}\left(\sqrt{x+1}+3\right)=3$

b. $\lim_{time\to\infty}$ (a soda's temperature) = room temperature

2. **[Challenge]** Consider the functions $f(x)=\log(3-x)$ and $g(x)=\sqrt{x-3}-2$. Desmos (desmos.com/calculator/at1vlfols5).

a. What is the domain of each function?

b. Graph the following function in Desmos:

$$h(x)=\begin{cases}\log(3-x) & \text{for } x<3\\ \sqrt{x-3}-2 & \text{for } x\geq 3\end{cases}$$

c. Explain why h is not continuous at $x=3$.

d. What is the range of each function?

3. Sketch a graph of each of the functions below. Compare the equations and their graphs. Then write a complete set of approach statements for each.

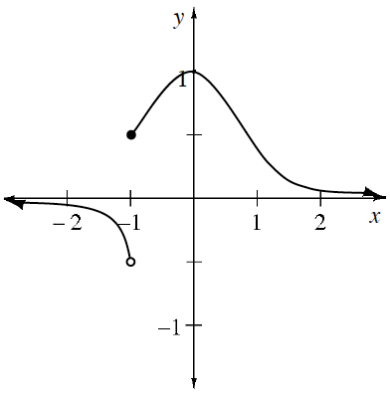
a. $y=\frac{(x+6)(x-1)}{x-1}$

b. $y=\frac{(x+6)(x-1)}{x-2}$

c. Explain why one graph has a hole while the other has a vertical asymptote.

d. What is the end behavior of each function?

4. Write as many limit statements as you can about the function graphed below as $x\to -1$ and $x\to\pm\infty$.



5. **[Challenge]** Write the equation of the line that passes through the vertex of $y=2x^2+6x-20$ with a slope of $-\frac{7}{3}$. Write your answer in *point-slope* form.

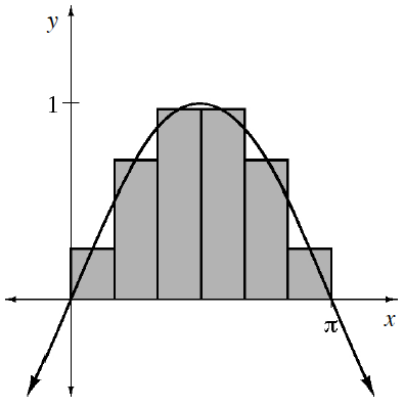
6. **[Challenge]** If $f(x)=\sqrt[3]{x}$, write an expression for each of the following function operations.

a. $f^{-1}(x)$

b. $f\left(f^{-1}(x)\right)$

c. $f^{-1}(f(x))$

7. For $f(x)=\sin(x)$, an estimation of the area under the curve for $0\leq x\leq\pi$ is shown below using six midpoint rectangles of equal width.

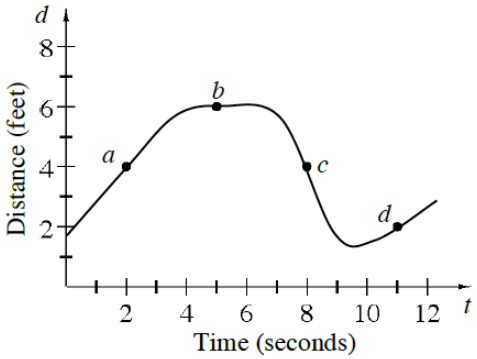


a. Estimate the area using these rectangles.

b. If the shaded region is rotated about the x-axis, then each of these rectangles becomes what shape? Sketch a picture representing this situation.

c. Estimate the volume of this rotated region by calculating the volume of each of the rotated rectangles.

8. Zuhaib is anxiously waiting for the results of his calculus test and is pacing back and forth as shown in the graph below.



a. At which point (a, b, c, or d) is Zuhaib's speed the greatest? Approximate the rate.

b. At which point is Zuhaib's velocity the greatest? Approximate the rate.

c. What is the difference between speed and velocity?