

Homework #19

First & Last Name: _____

Class: _____

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

1. Theo has done it again. Before he lost his graph, he used it to determine the following properties of his motion. Help him re-create a possible graph of this motion.

Details:

- He changed directions three times during his 8-foot walk.
- His average velocity was 0 feet per second.
- Theo walked for 6 seconds and started 5 feet from the motion detector.

2. Carefully graph

$$f(x) = \begin{cases} \sqrt{x} & \text{for } 0 < x < 4 \\ (x-6)^2 - 2 & \text{for } 4 \leq x < 10 \end{cases}$$

on your paper. Then, write a detailed slope statement. [Desmos](https://www.desmos.com/calculator/qbchvz9178) (desmos.com/calculator/qbchvz9178).

3. Given the tables below:

x	-2	-1	0	1	2	3	10	100
$f(x)$	-11	-8	-5	-2	1	4	25	295

x	-3	-2	-1	0	1	2	3	12
$g(x)$	-5	0	3	4	3	0	-5	-140

x	-2π	$-\pi$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	12π
$h(x)$	2	-2	2	0	-2	0	2	2

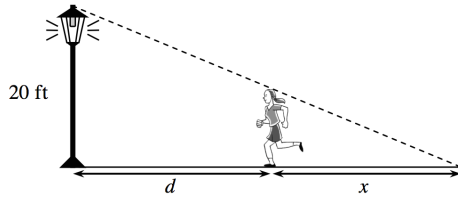
[Desmos](https://www.desmos.com/calculator/vdbcdjalaa) (desmos.com/calculator/vdbcdjalaa).

- a. Write possible equations for the functions f , g , and h .
- b. Evaluate:
- i. $f(g(h(\pi)))$
 - ii. $h(g^{-1}(4))$
 - iii. $f^{-1}(h(\pi))$
4. The population of Smalltown on January 1st for 5 years is shown in the table below.

Year	2011	2012	2013	2014	2015
Pop.	2300	2415	2536	2663	2796

- a. Write a slope statement for the given data.
 - b. Calculate the average rate of change per year in the population between 2011 and 2015.
 - c. Approximate the rate of change of the population on January 1st, 2014. Explain how you got your answer.
5. Draw two *different* distance graphs that each has an average velocity of 5 meters per minute. [Desmos](https://www.desmos.com/calculator/oilgur7w8i) (desmos.com/calculator/oilgur7w8i).
6. The area between the x -axis and $f(x) = -|x - 3| + 5$ forms a flag. Calculate the volume of the solid generated when this flag is rotated about the x -axis.

7. [Challenge] Write the equations of two non-trivial functions f and g such that $f(g^{-1}(x)) = \sqrt{3x-2} + 6$.
8. Shehazana, who is 5.5 feet tall, is walking toward a 20-foot tall streetlight. Write an equation for the length of her shadow, x , in terms of the distance, d , she is from the pole. Visualize this situation using [Desmos](https://www.desmos.com/calculator/nudkxocnul) (desmos.com/calculator/nudkxocnul).



9. [Challenge] State the domain of each of the following functions.
- $f(x) = \sec(x)$
 - $g(x) = \log(x^2 + 1)$
 - $h(x) = \frac{x^2 - 4}{x^2 - x - 6}$
 - $k(x) = \frac{\log(x-1)}{\sqrt{x^2 - 16}}$
10. [Challenge] Multiple Choice: When the graph of $f(x) = 1 - 2^x$ is reflected across the y -axis, the equation of the resulting graph is:
- A. $g(x) = 1 - 0.5^x$ B. $g(x) = 1 + 2^x$ C. $g(x) = 2^x - 1$ D. $g(x) = \log_2(x - 1)$ E. $g(x) = \log_2(1 - x)$