Purpose: This problem set defines complements the Desmos activity from class which defined average rate of change through particular examples. This space is designed for you to collect your thoughts and explore this topic on paper through applications data expressed numerically, graphs, and formulas.

Definitions:

- A **rate of change** describes how the output quantity changes in relation to the input quantity. The units on a rate of change are "output units per input units".
- The **average rate of change** between two input values is the total change of the function values (output values) divided by the change in the input values. We might express this quantity as follows:

$$\text{Average Rate of Change} = \frac{\text{Change of Output}}{\text{Change in Input}} = \frac{\Delta y}{\Delta x}$$

Use the space below to take notes on the last page of the Desmos activity.

1. How do I find the average rate of change of a function given two coordinates?

2. How do I find the average rate of change of a function when given a graph?

3. How do I find the average rate of change of a function when given a table?

4. How do I find the average rate of change of a function when given a function and two inputs?

5. Any questions I still have for average rates of change that I need to keep in mind as I work through this problem set and homework?

1. The table below shows the number of calories used per minute as a function of an individual's body weight for three sports.

Activity	100 lb	120 lb	150 lb	170 lb	200 lb	220 lb
Walking	2.7	3.2	4	4.6	5.4	5.9
Bicycling	5.4	6.5	8	9.2	10.8	11.9
Swimming	5.8	6.9	8.7	9.8	11.6	12.7

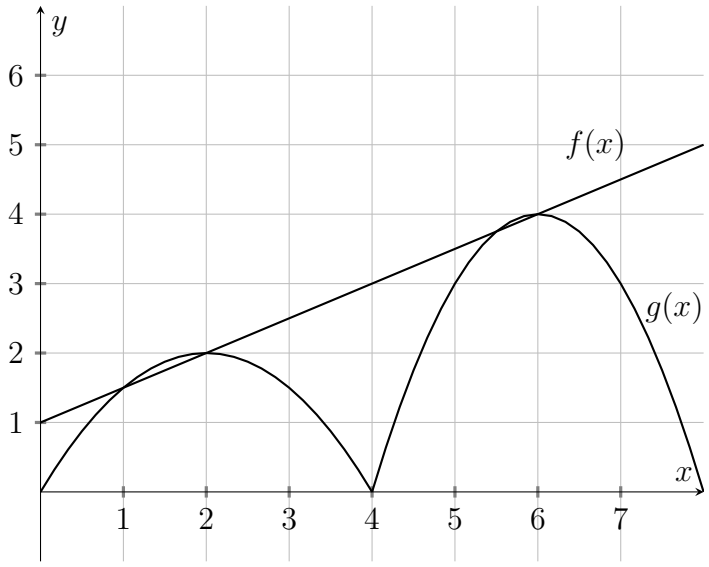
(a) Determine the number of calories a 200 lb person uses in one half hour of walking.

(b) Suppose a 150 lb person swims for one hour and a 220 lb person bikes for one hour. Who uses more calories?

(c) Does the number of calories a person uses for swimming increase or decrease as weight increases?

(d) If a person continues to swim or bike for several months, their calories used per minute in each sport may decrease. Why do you think this might occur?

2. Using the graphs of the line, $f(x)$, and the other function, $g(x)$, below, fill out the table listing their average rates of change.



Interval	Average Rate of Change of $f(x)$	Average Rate of Change of $g(x)$
$0 \leq x \leq 2$		
$0 \leq x \leq 6$		
$2 \leq x \leq 6$		
$4 \leq x \leq 8$		
$4 \leq x \leq 5$		
$2 \leq x \leq 4$		
$1 \leq x \leq 2$		

(a) Is there an interval contained in $(1, 2)$ on which the average rate of change of $f(x)$ is equal to that of $g(x)$? If so, how do you know?

(b) Sketch a line through the origin whose slope is the average rate of change of $g(x)$ between $x = 0$ and $x = 5$.

3. Suppose $h(x) = x^2 - 8$.

   (a) Find the average rate of change between the points $(-1, h(-1))$ and $(2, h(2))$.

   (b) Find the average rate of change between the points $(a, h(a))$ and $(b, h(b))$.

4. Suppose $f(x) = 9$.

   (a) Find $f(0)$.

   (b) Find $f(a)$.

   (c) Find the average rate of change between $(0, f(0))$ and $(a, f(a))$.

5. A rectangular box with no top has volume 6m^3 and has a square base.

   (a) Express the surface area, S, of the box as a function of the length, l, of one of the sides. Draw a figure first!

   (b) Find the average rate of change of Surface area as l goes from 1m to 2m

Reflection Questions:

1. Restate the definitions of domain and range.

2. Given a graph of a function, how will you determine the domain and range?

3. Given a formula for a function, what might you look for to find the domain?