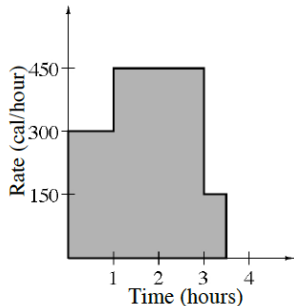


# Homework #21

First & Last Name: \_\_\_\_\_ Class: \_\_\_\_\_

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

- What is the difference, if any, between the values of  $\sum_{j=3}^8 j^2$  and  $\sum_{j=2}^7 (j+1)^2$ ?
- William wants to figure out how many calories he burns while at the gym. The number of calories he burns depends on which exercises he does during his workout. Given the graph below of the rate he burns calories, answer the questions that follow.



- How many calories does William burn during the first hour of exercise? Support your answer with a short explanation of how you arrived at this result.
  - How many calories does William burn by the end of his workout?
  - What is the average number of calories that he burns per hour?
- Rewrite the summation notation

$$\sum_{i=6}^{11} f(i)$$

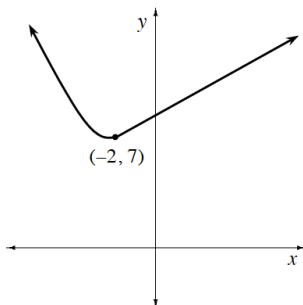
so that the index goes from  $i = 10$  to  $i = 15$  and the result will be the same for any given function.

- [Challenge]** Kristin is designing a model that will represent the path of a roller coaster. She has determined the beginning and the end parts of the track, but needs to write a formula for the middle section that will join the other segments. She decides that she wants one peak in this middle section, not including its boundaries. What values of  $a$  and  $b$  will make her model, given below, a continuous function? To help you visualize this, use [Desmos](https://www.desmos.com/calculator/2rladomjgl) (desmos.com/calculator/2rladomjgl).

$$f(x) = \begin{cases} -2 \cos(x) + 3 & \text{for } x \leq 0 \\ a \cos(bx) - 2 & \text{for } 0 < x \leq 2\pi \\ -\cos(2x) - 4 & \text{for } x > 2\pi \end{cases}$$

- Given the graph of  $y = h(x)$  below, sketch:

- $y = -h(x)$
- $y = h(x) - 5$
- $y = h^{-1}(x)$



6. Write a complete set of approach statements for

$$y = \frac{(3x - 1)(x + 2)}{3x - 1}$$

7. If  $f(x) = 2x + 3$ , calculate the area under the curve  $5 \leq x \leq 7$ . [Desmos](https://www.desmos.com/calculator/8zx7oyajor) (desmos.com/calculator/8zx7oyajor).
8. **[Challenge]** If the inverse of  $f$  is a continuous function, why must the function be either strictly increasing or decreasing? Sketch an example to support your reasoning.
9. **[Challenge]** Write an equation that will approximate the area under  $f(x) = \cos(x)$  over the interval  $[-\frac{\pi}{2}, \frac{\pi}{2}]$  using six trapezoids with equal height. How can you use the fact that this is an even function to save yourself some work?