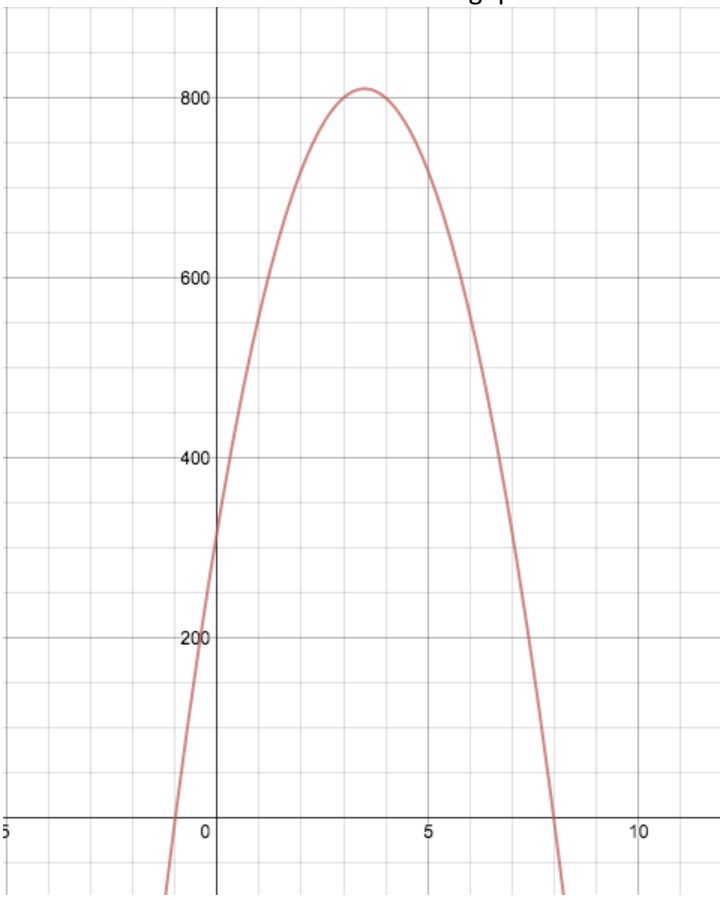
Comparing Key Points of Functions Name: _____ A#_____

1. A science class was assigned a project to design a ball launcher and test it by shooting a tennis ball straight up from the top of a building. The class was split into 2 teams. Team One determined that the motion of the ball launched from their machine could be described by the function $h(t) = -16t^2 + 144t + 160$, where *t* represents the time the ball is in the air in seconds and *h(t)* represents the height, in feet, of the ball above the ground at time *t*. Team Two represented their ball machine using the graph below where height is graphed as a function of time. Use these two teams functions to answer the following questions.



a) How do the *y*-intercepts compare for the two representations? What is the meaning of the *y*-intercept in this context?

b) Which team's tennis ball reached a greater height from the ground? How much higher did that teams tennis ball travel?

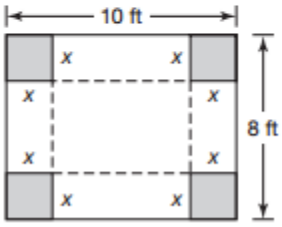
c) Which team's ball took longer to hit the ground? How much longer?

d) If team one and team two entered a contest with their respective ball launcher, what would the objective need to be for team one to win? What would the objective need to be for team two to win?

2.

Cynthia is an engineer at a manufacturing plant. Her boss asks her to use rectangular metal sheets to build storage bins with the greatest possible volume. Each rectangular sheet is 8 feet by 10 feet.

Cynthia's sketch shows the squares to be removed from the corners of each sheet. The dashed lines indicate where the metal sheets will be folded before they are welded to form the prism-shaped storage bins without tops.

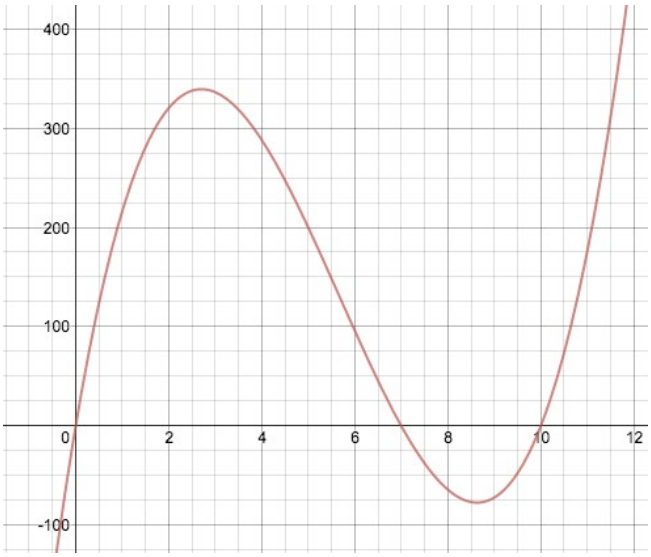


a. Write a function to represent volume in terms of the height h.

b. What do the *x*-intercepts represent in this problem situation? Do these values make sense in terms of this problem situation? Explain your reasoning.

c. Write the domain of this function in context as an inequality. Explain your reasoning.

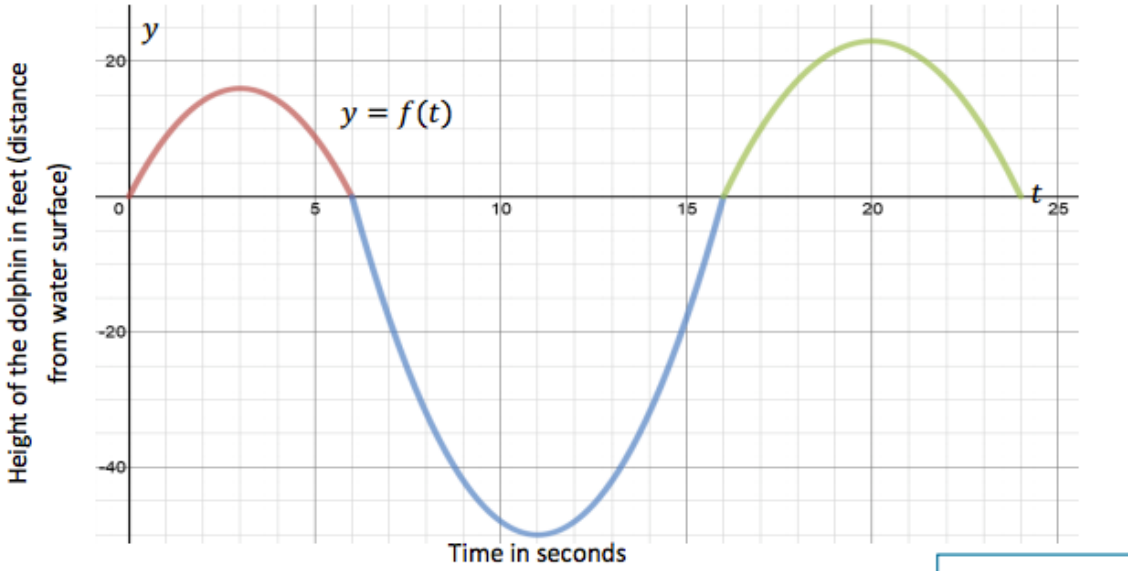
3. Cynthia decided to make planters out of larger sheets of copper. The volume of the new storage bins can be expressed with the graph below.



a. Estimate the maximum volume of this storage bin. How does this maximum volume compare the maximum volume for the bin in #2?

b. Is the domain in context the same for this storage bin as it was for the bin in #2? If not, what is the domain? What is the range?

4. In a study of the activities of dolphins, a marine biologist made a 24-second video of a dolphin swimming and jumping in the ocean with a specially equipped camera that recorded one dolphin's position with respect to time. This graph represents a piecewise function, *f(t)*, that is defined by quadratic functions on each interval. It relates the dolphin's vertical distance from the surface of the water, in feet, to the time from the start of the video, in seconds. Use the graph to answer the questions below.



a. Use inequalities or interval notation to indicate when the dolphin is increasing in height.

b. Use inequalities or interval notation to indicate when the dolphin is decreasing in height.

c. Where will you find the values for which *f(t)* = 0 and explain what they mean in the context of this problem.

d. When will the dolphin be less than or equal to 20 feet below the sea? Use inequality or interval notation.