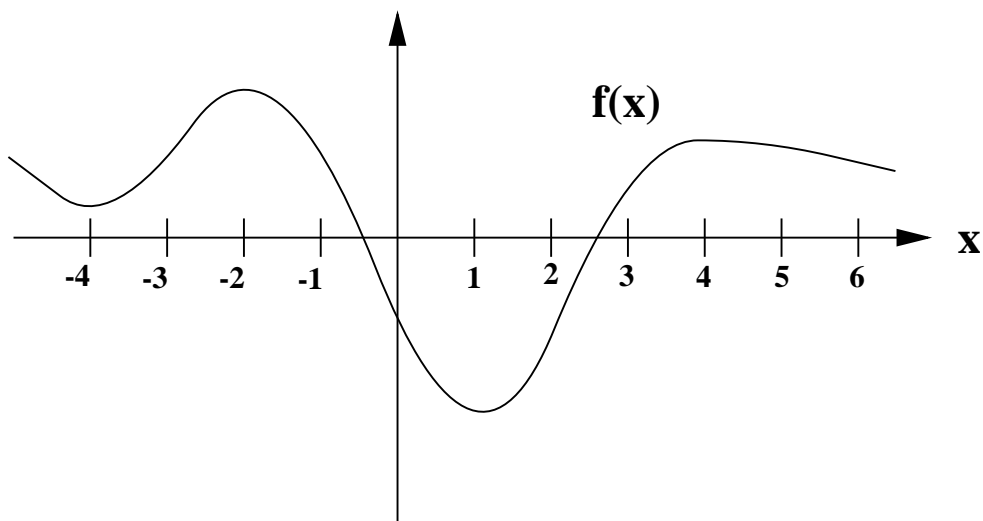


Name \_\_\_\_\_

1. Dorothy emptied a bucket of water upon the Wicked Witch of the West who immediately began to melt. If the Scarecrow only had a brain, he would calculate that the witch's height could now be given by the function  $h(t) = 63(0.91)^t$ , where  $t$  is measured in seconds since the water was first thrown upon the witch, and  $h(t)$  is measured in inches.

At time  $t = 11$  seconds, how tall was the witch and how quickly was her height changing? Each answer should be correctly rounded off to one place after the decimal point and include proper units.

2. Use the graph of  $f(x)$  given below to answer the following questions.



(a) Which of the following quantities has the largest positive value:

$$f(-4), \quad f(-2), \quad f(0), \quad f(2), \quad f(4), \quad \text{or} \quad f(6) ?$$

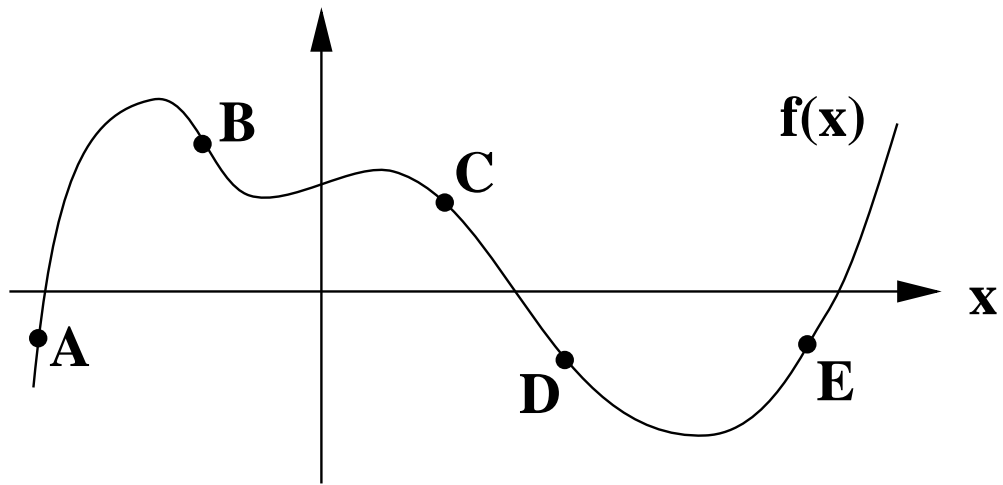
(b) Which of the following quantities has the largest positive value:

$$f'(-4), \quad f'(-2), \quad f'(0), \quad f'(2), \quad f'(4), \quad \text{or} \quad f'(6) ?$$

(c) Which of the following quantities has the largest positive value:

$$\frac{f(4) - f(0)}{4 - 0}, \quad \frac{f(6) - f(0)}{6 - 0}, \quad \frac{f(2) - f(-4)}{2 - (-4)}, \quad \frac{f(2) - f(-2)}{2 - (-2)}, \quad \text{or} \quad \frac{f(6) - f(-2)}{6 - (-2)} ?$$

4. State whether the derivative of the function graphed below is positive, negative, or zero at each of the labeled points.



5. A man lives in a high-rise apartment building. He leans out from one of his apartment windows and throws a ball upward. Between the time that the ball is thrown and the time that the ball hits the ground, the height of the ball is given by the formula  $h(t) = -16t^2 + 96t + 160$ , where  $t$  is the number of seconds since the ball is first thrown and  $h(t)$  is measured in feet above ground-level.

(a) What is the average velocity of the ball during the first 2 seconds?

(b) Approximate the instantaneous velocity of the ball at  $t = 1.5$  seconds.

(c) When does the ball reach its maximum height?

(d) What is the ball's maximum height?

(e) When does the ball hit the ground? Give your answer to at least one decimal place.

(f) How fast is the ball going when it hits the ground?

11. After a weekend away from school, a student carrying a flu virus returned to an isolated college campus. The virus spread and the total number of infected students  $t$  days after the student returned to campus can be approximated by  $f(t)$ .

(a) Suppose that  $f(6) \approx 180$ . Which of the following choices best describes what this means in practical terms?

(a) Six days after the student returned to campus, there were a total of 180 students infected with the flu virus.

(b) Six days after the student returned to campus, the number of infected students was increasing by 180 students per day.

(c) During the first 6 days after the student returned to campus, the number of infected students was increasing at an average rate of 180 students per day.

(d) The flu lasted for 6 days. A total of 180 students were infected each day.

(e) Every 6 days, 180 more students came down with the flu.

(b) Suppose that  $f'(6) \approx 10$ . Which of the following choices best describes what this means in practical terms?

(a) Six days after the student returned to campus, there were a total of 10 students infected with the flu virus.

(b) Six days after the student returned to campus, the number of infected students was increasing by 10 students per day.

(c) During the first 6 days after the student returned to campus, the number of infected students was increasing at an average rate of 10 students per day.

(d) The flu lasted for 6 days. A total of 10 students were infected each day.

(e) Every 6 days, 10 more students came down with the flu.

(c) Given that  $f(6) \approx 180$  and  $f'(6) \approx 10$ , approximate the total number of students that were infected with the flu virus 7 days after this student returned to campus?

(a) 250

(b) 240

(c) 210

(d) 190

(e) 70