

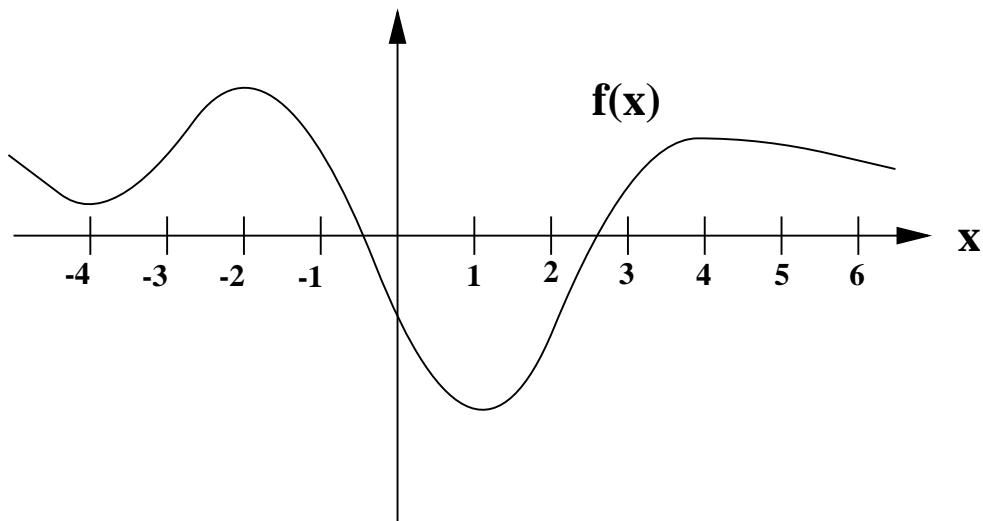
Name _____

RULES FOR THIS TEST:

- Do not borrow another student's calculator.
 - Circle each final answer.
 - A correct answer will only be given full credit if enough work is shown to justify that answer.
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1. (13 points) Give a good estimate for $g'(2)$ if $g(t) = 85(1.7)^t$.

2. (15 points) 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:

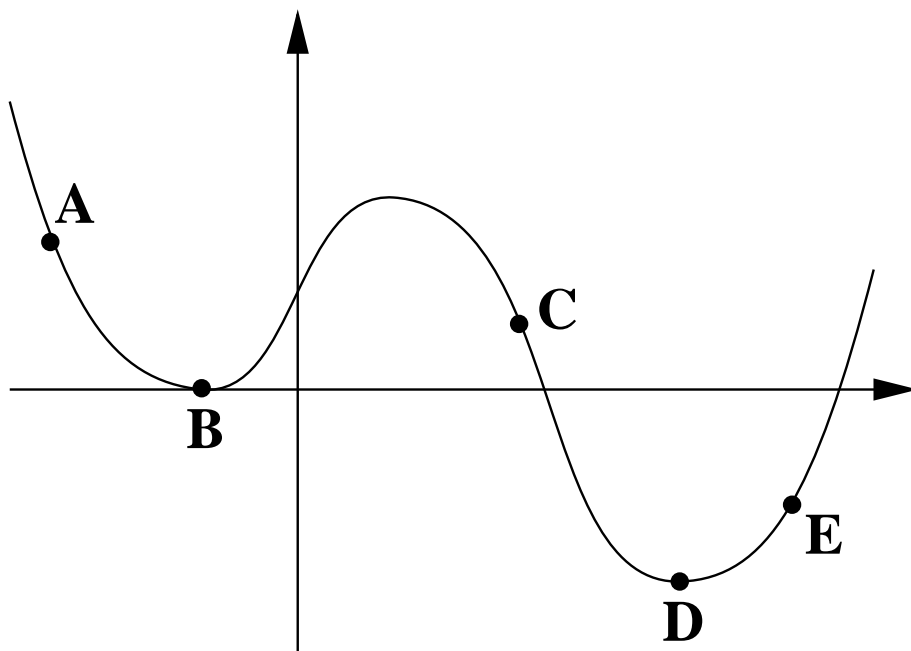
$$\frac{f(4) - f(0)}{4 - 0}, \quad \frac{f(6) - f(0)}{6 - 0}, \quad \frac{f(2) - f(-4)}{2 - (-4)}, \quad \frac{f(2) - f(-2)}{2 - (-2)}, \quad \text{or} \quad \frac{f(6) - f(-2)}{6 - (-2)} ?$$

3. (24 points) The oldest and largest wildlife survey in the world is the Christmas Bird Count sponsored each year by the National Audubon Society. In Athens, Georgia, volunteers counted the number of American Goldfinches and I have recorded their results from 1992 to 1995 in the table below.

year	1992	1993	1994	1995
# goldfinches	256	175	139	110

- (a) What is the average rate of change in the number of goldfinches between 1992 and 1995? Give your to at least one decimal place and be sure to include proper units.
- (b) Use the regression features of your calculator to find a formula for the exponential function which best fits this data. Each number in your formula should be given to at least two decimal places. It will be helpful to let $t = 0$ in 1992.
- (c) According to the formula found in part (b), by what percentage is the population of goldfinches decreasing each year?
- (d) Use the formula found in part (b) to estimate the number of goldfinches that one might expect to be counted in 2002.

4. (15 points) State whether the derivative of the function graphed below is positive, negative, or zero at each of the labeled points.



5. (18 points) 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?

6. (15 points) Nancy thinks that Todd is driving too fast. She would like to know how fast he is driving but his car's speedometer is broken. She decides to record his car's odometer reading every 5 minutes for the next half hour. Here are her results:

TIME (minutes)	0	5	10	15	20	25	30
ODOMETER READING (miles)	3000	3004	3009	3015	3020	3024	3027

- (a) What is the car's average velocity during the first 10 minutes that Nancy was keeping a record?
- (b) Approximate the car's instantaneous velocity 25 minutes after Nancy started keeping a record.
- (c) The speed limit in Todd's city is 65 miles per hour. Todd claims that he never exceeded the speed limit but Nancy feels sure that at some point he drove faster than the speed limit. Who is correct? Clearly explain your reasoning.