

Math 152 Learning Target Quiz 5

March 19, 2021

Name: _____

Instructions: Read the following instructions carefully.

- You do not need to complete every question. Choose the learning targets that are most important for you and focus on those.
- **You must show ALL of your work in order to earn full credit on any of the learning targets.**
- You may use any calculator you wish, so long as it does not have communications abilities (e.g., iPods, iPads, smartphones, laptops, etc.) or symbolic manipulation capabilities (e.g., TI-89).
- You may not use any notes, notecards, books, formula sheets, etc.
- Feel free to ask any questions you want – especially if instructions are unclear, or if you want advice about which learning targets to attempt.

Learning Target	Assessment	Learning Target	Assessment
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		CE	

Given information about a function (either a table of data or a graph), answer questions about its average and/or instantaneous rates of change.

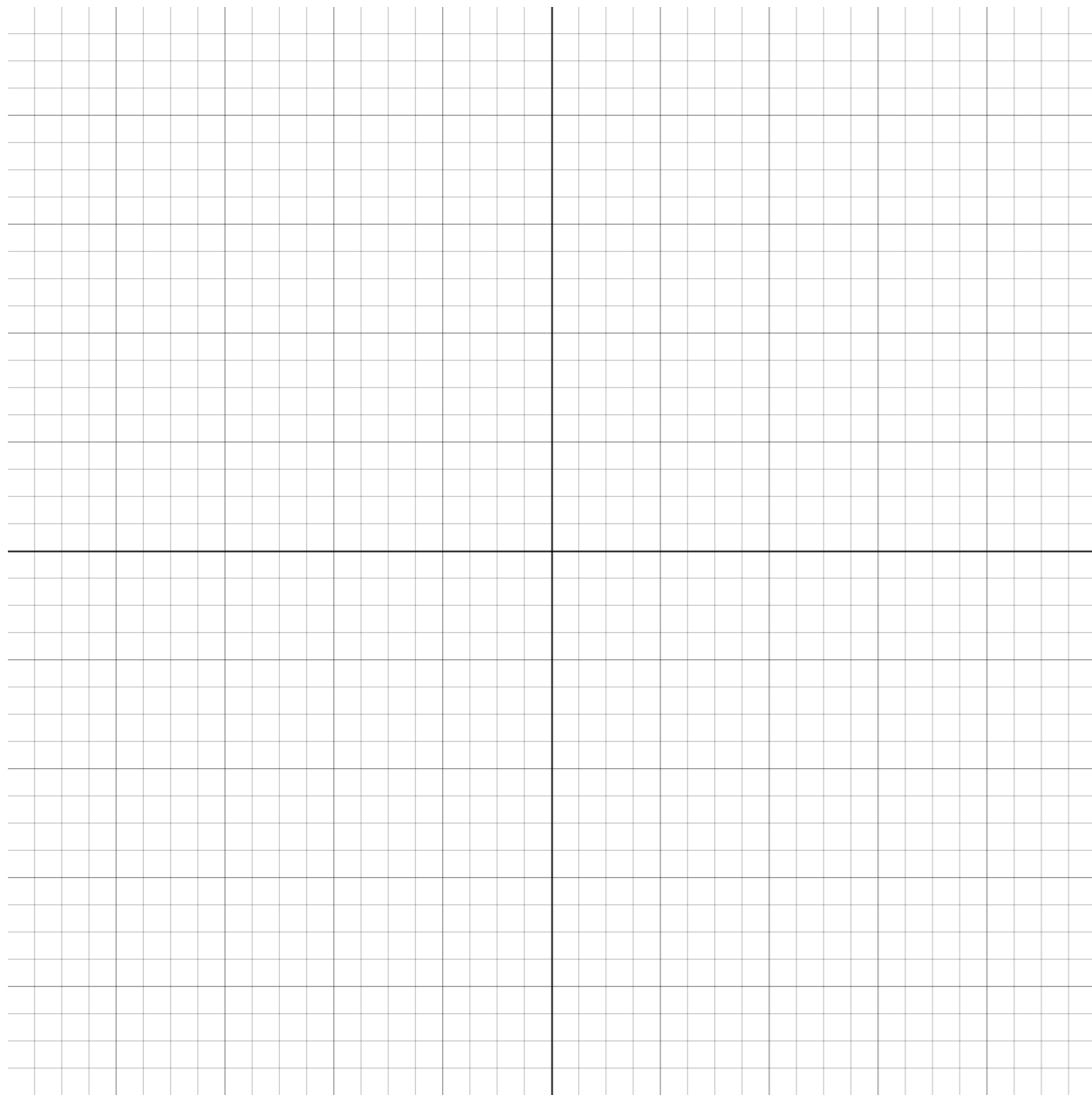
1. Traffic speed S along a certain road (in km per hour) varies as a function of traffic density q (number of cars per km of road). Use the data in the table to find the average rate of change between densities of 70 and 90. Interpret your answer, including the units.

q (density)	60	70	80	90	100
S (speed)	72.5	67.5	63.5	60	56

Sketch a graph that has specific behaviors at indicated points and intervals.

2. Sketch the graph of a function satisfying: $f(0) = 1$; $f'(x) > 0$ and $f''(x) < 0$ for all x .

Make sure to label your grid with an appropriate scale!

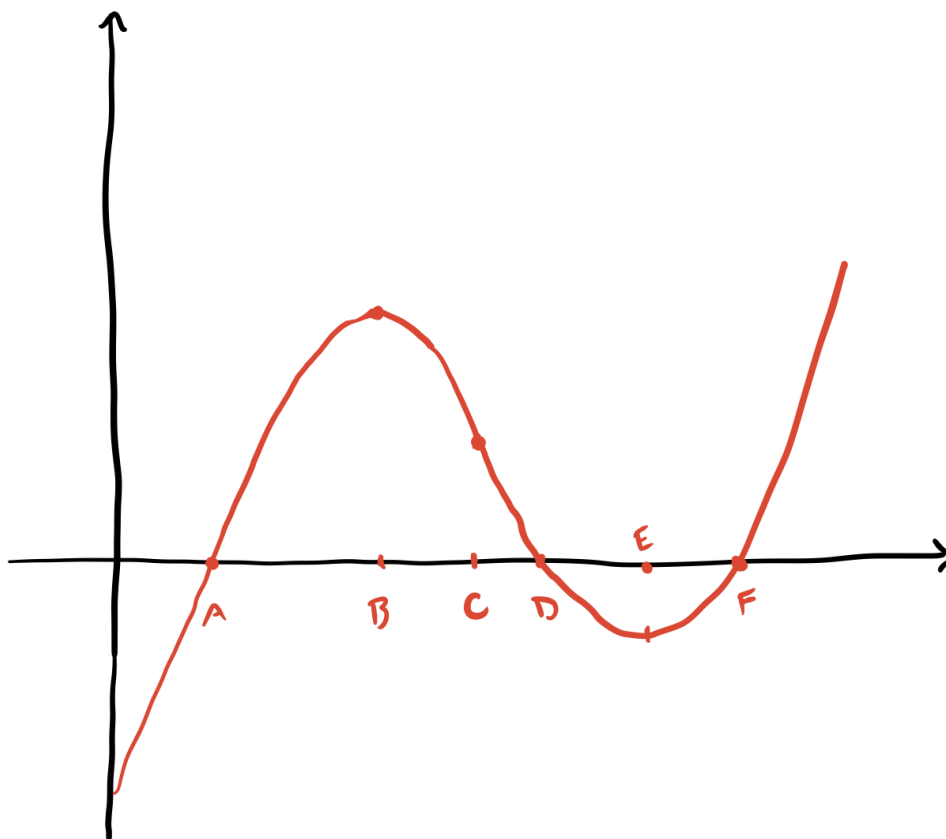


Given the graph of a function, answer questions about the function, its derivative, and its second derivative.

3. Consider the graph of $f(x)$ below. At which of the marked values of x is

- a. $f(x)$ greatest?
- b. $f(x)$ least?
- c. $f'(x)$ positive?
- d. $f'(x)$ negative?
- e. $f''(x) = 0$?

Note that there may be more than one answer. You should clearly explain why your identified point satisfies the stated condition.



Use the limit definition to find the derivative function.

4. Recall that $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$. Use the limit definition to calculate the derivative of $f(x) = 4x^2 + 2x - 1$. Note: to earn credit, you are required to use the limit definition, but may check your work using appropriate derivative rules if you would like.

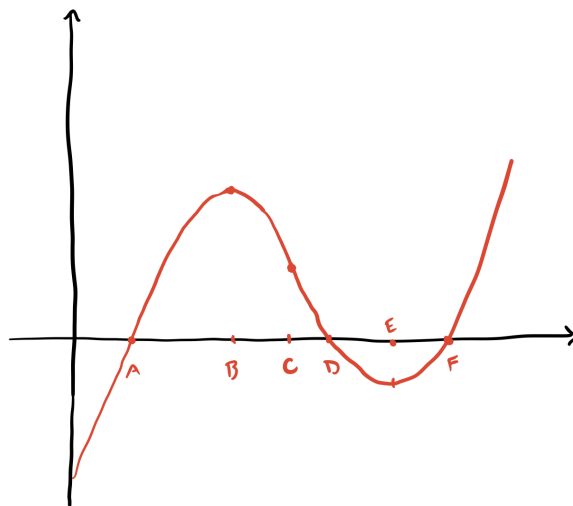
Use the central difference and other estimation techniques to answer questions about applications of the derivative.

5. Traffic speed S along a certain road (in km per hour) varies as a function of traffic density q (number of cars per km of road). Use the data in the table to estimate $S'(q)$ when $q = 75$. Interpret your answer, including the units.

q (density)	60	70	80	90	100
S (speed)	72.5	67.5	63.5	60	56

Given the graph of the derivative, answer questions about the function, the first derivative, and the second derivative.

6. Consider the graph of a derivative below.
- State an interval on which the **original function** is increasing.
 - State an interval on which the **original function** is decreasing.
 - Give the location of a point of inflection of the original function.



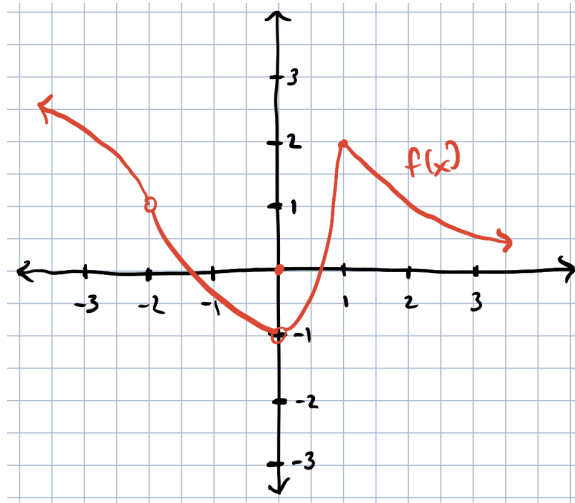
Given the graph of a function, determine the values of indicated limits.

7. Consider the function $f(x)$ below, and calculate the indicated limits. If the limit does not exist, explain why.

a. $\lim_{x \rightarrow -2^-} f(x)$

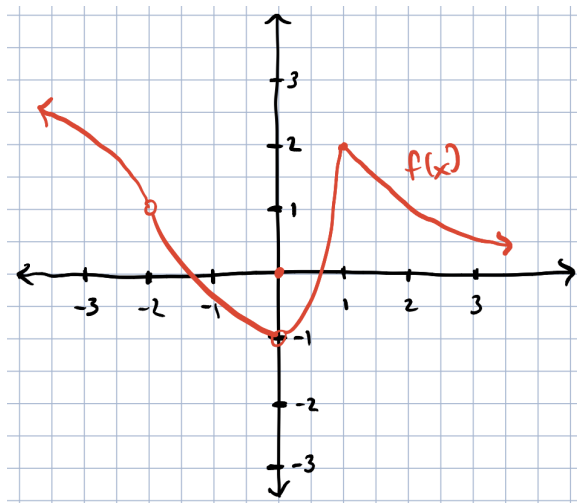
b. $\lim_{x \rightarrow 0} f(x)$

c. $\lim_{x \rightarrow 1} f(x)$



Given the graph of a function, determine the x -values where the function is not continuous and the points where it is not differentiable.

8. Consider the graph below. At which point(s), if any, is the function not continuous? At which point(s), if any, is it continuous but not differentiable?



Find a local linearization, use it to estimate the function at a nearby point, and answer questions about the accuracy of that estimate.

9. Given $f(x) = e^x$, it is known that $f'(x) = e^x$.
- Calculate the local linearization $L(x)$ at $a = 0$.
 - Use your answer from part (a) to estimate $e^{0.1}$.

Find the equation of a tangent line.

10. Find the equation of the line tangent to $g(x) = (x^4 + 5)^3$ at the point $(0, 125)$.

Given information about two or more functions (either graphs or values, but not the equations), answer questions about new functions involving those functions and their derivatives.

11. Values of f , f' , g , and g' are given in the table. Let $u(x) = f(g(x))$ and $v(x) = f(x) \cdot g(x)$.

a. Find $u'(6)$.

b. Find $v'(4)$.

	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
$x = 1$	4	5	4	5
$x = 4$	0	7	1	$\frac{1}{2}$
$x = 6$	6	4	6	3

Find dy/dx for a function given implicitly.

12. Find $\frac{dy}{dx}$ given $e^{x-y} = 2x^2 - y^2$.

Use L'Hopital's Rule to evaluate limits involving indeterminate forms.

13. Calculate $\lim_{x \rightarrow \pi/2} \frac{\cos(x)}{\sin(x)}$.