

## Math 152 Learning Target Quiz 2

February 26, 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
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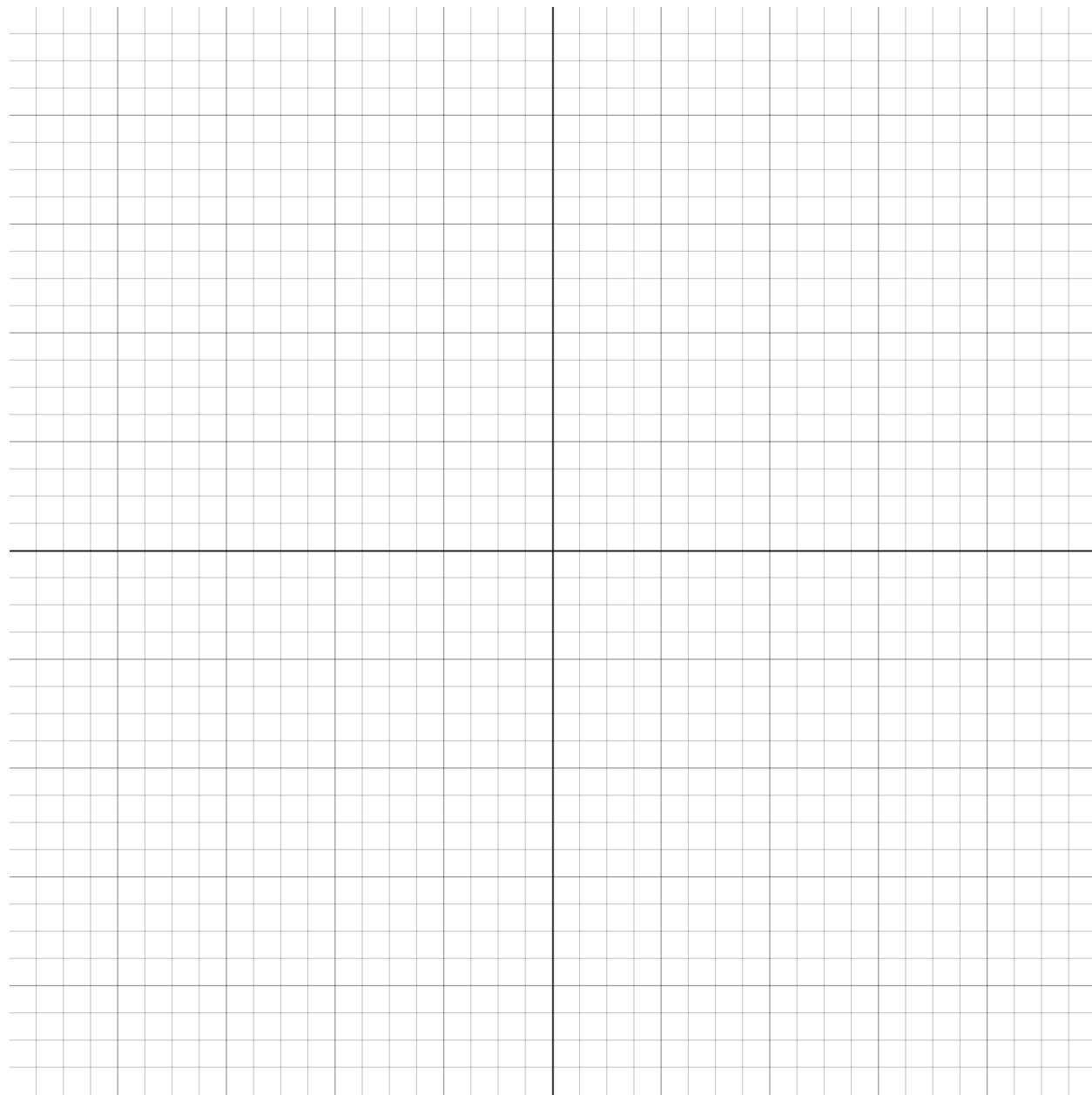
**Given information about a function (either a table of data or a graph), answer questions about its average and/or instantaneous rates of change.**

1.

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

2. Sketch the graph of a function satisfying:  $f(0) = -3$ ;  $f'(x) > 0$  on the intervals  $[-4, -2]$  and  $[2, 4]$ , and  $f'(x) < 0$  on the interval  $[-2, 2]$ ;  $f''(x) > 0$  on the interval  $[-4, 0]$  and  $f''(x) < 0$  on the interval  $[0, 4]$ .

**Make sure to label your grid with an appropriate scale!**

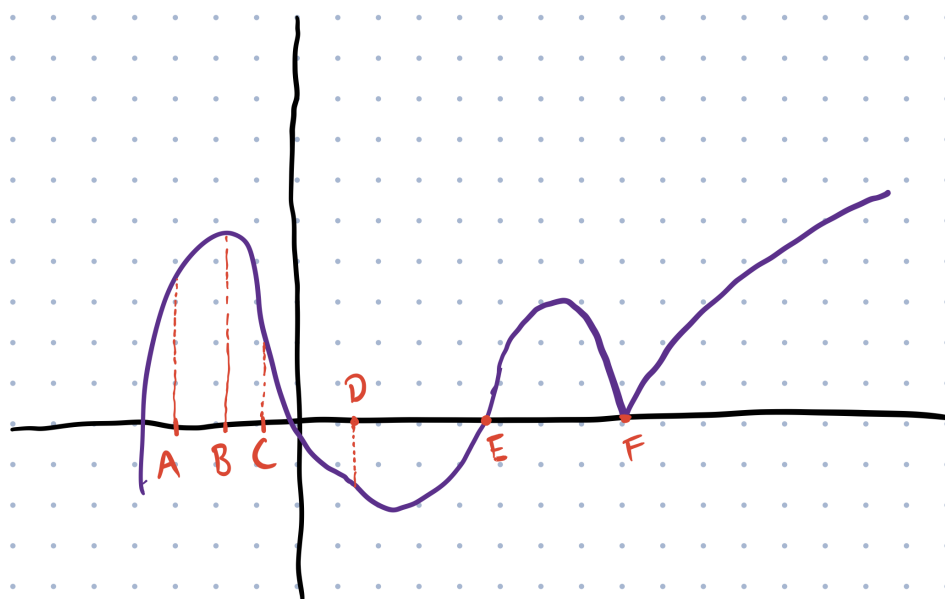


Given the graph of a function, answer questions about the function, its derivative, and its second derivative.

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.  $f''(x)$  greatest?
- f.  $f'(x)$  undefined?

**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  $f(x) = x^2 - 2x + 1$ . 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.

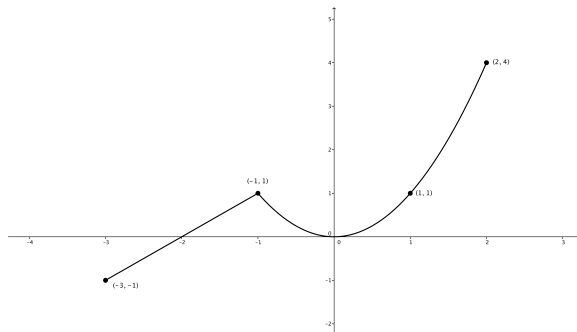
Use the central difference and other estimation techniques to answer questions about applications of the derivative.

5. The number  $N(t)$  of locations of a popular coffee chain is given in the table.
- Use the central difference to estimate the instantaneous rate of growth in 2009 and 2011.
  - What do you conclude about the rate of *growth* in the number of locations around 2010?

Year	2004	2006	2008	2010	2012
$N$	8569	12,440	16,680	16,858	18,066

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**  $f'(x)$  below.
- On what interval(s) is  $f$  increasing? Decreasing?
  - Where is  $f$  concave up? Concave down?



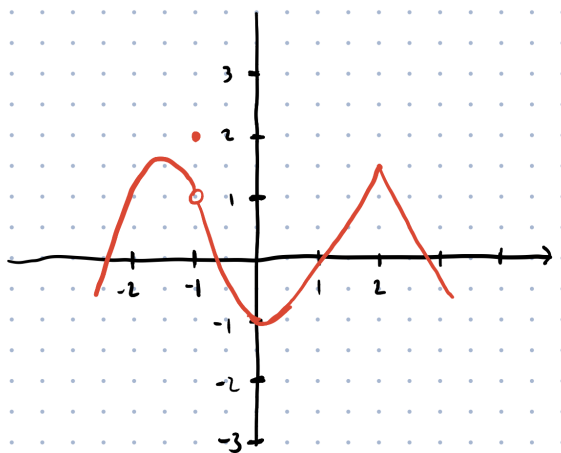
Given the graph of a function, determine the values of indicated limits.

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

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

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

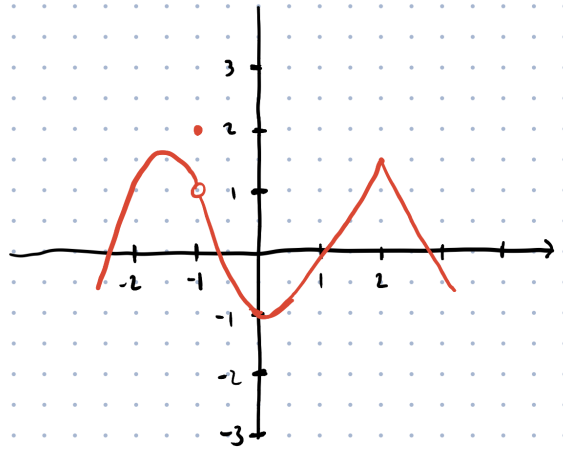
c.  $\lim_{x \rightarrow 2} f(x)$





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  $f(x) = \frac{1}{x}$ , it is known that  $f'(x) = -\frac{1}{x^2}$ .
- Calculate the local linearization  $L(x)$  at  $a = 4$ .
  - Use your answer from part (a) to estimate  $\frac{1}{4.002}$ .