

Math 121 - Calculus I
Exam 3: Practice Exam

Name:
Section:

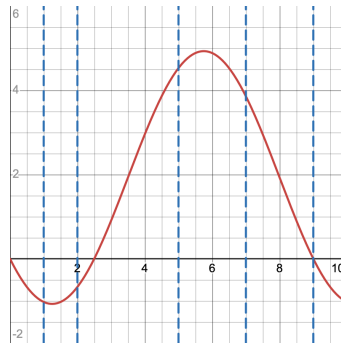
Please be sure to neatly **show and explain all of your work** and clearly label your answers. Except for your index card, this exam is a closed-book, closed-notebook exam. Calculators are not allowed.

Please write and sign the Honor Pledge here when you are done:

Signed:

Problem	Points
1	/10
2	/10
3	/10
4	/8
5	/12
6	/10
Total	/60

1. Consider the following graph of the function $f(x)$.



Consider the values $x = 1, 2, 5, 7, 9$. For each question below, list all of these values that apply. For each, explain your reasoning.

- (a) For which of these values is $f(x) > 0$?
- (b) For which of these values is $f'(x) > 0$?
- (c) For which of these values is $f(x)$ increasing?
- (d) For which of these values is $f'(x)$ increasing?
- (e) For which of these values is the slope of $f(x)$ negative?
- (f) For which of these values is the slope of $f'(x)$ negative?

2. Suppose that

$$f(x) = (3x + 8)^{1/3}.$$

(a) Use a linearization to estimate the value of $f(0.1)$.

(b) Is your estimate an overestimate or an underestimate? Please explain.

3. Suppose that the *derivative* of $f(x)$ is given by

$$f'(x) = \frac{(x-1)^2x}{(x+1)^3}.$$

Find the local maxima and minima of $f(x)$ assuming that the domain of $f(x)$ is all $x \neq -1$.

4. Find the absolute maximum and absolute minimum values of

$$f(x) = x + \frac{1}{x}$$

on the interval $[0.2, 4]$.

5. Use first and second derivative information to sketch a graph of

$$f(x) = 4x^5 - 5x^4 - 12.$$

Clearly label the coordinates of the y -intercept and the x -values of any local maxima, local minima, or inflection points.

6. A box with a square base and open top must have a volume of 32,000 cm^3 . Find the dimensions of the box that minimize the amount of material used. Confirm that your dimensions minimize the amount of material used.