

Exam #2

March 6, 2019

Name _____

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.
- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.
- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who opens a cell phone during the examination or if one is found on their seat or hand.

No calculators are allowed!

Honor Code: On my honor, I have neither received nor given any aid during this examination.

Signature: _____

1. (7 points each) Find the first derivative of the following function and simplify your answer

(a) $y = \frac{3x}{x-2}$

(b) $f(x) = \frac{1}{(2x+1)^3}$

(c) $h(x) = \sqrt{4x^2 - 3x + 5}$

(d) $g(x) = 2x(1-x)^5$

2. (7 pts) Suppose the cost of manufacturing q units is $C(q) = 3q^2 + q + 23$. **Estimate** the change in the cost if the production is increased from $q = 2$ to $q = 2.5$.

3. (7 points) $C(x)$ is the total cost of producing x units of a particular commodity. Assume $C(x)$ is in dollars.

$$C(x) = \frac{2}{3}x^3 - 2x + 3.$$

Find and interpret the marginal cost when $x = 10$.

4. (10 points) Find the critical numbers of the given function and classify each as a relative minimum or maximum

$$f(x) = x(x - 2)^2$$

5. (10 points each) Find the intervals where the function is increasing/decreasing

(a) $f(x) = x^3 - 12x$

(b) $f(x) = \frac{16}{x} + x^2$

6. (7 pts) Sketch a function that has the following properties. On your sketch, identify any inflection point(s) and relative extrema.

- $f'(x) < 0$ when $-2 < x < 5$
- $f'(x) < 0$ when $x < -2$ and $x > 5$
- $f''(x) > 0$ when $-2 < x < 0$ and $5 < x$
- $f''(x) < 0$ when $x < -2$ and $0 < x < 5$

7. (12 points) Find the intervals where the function is increasing/decreasing, concave up/down and find the relative min/max and inflection points. Use this information to sketch the function.

$$f(x) = \frac{x}{x^2 + 1}$$

8. (6 points each) A friend of yours is asking for help. He is taking a business calculus and needs to find the relative minimum and maximum of a function. He needs your help with two problems. He tried to send you the picture of the functions but his phone is broken and no picture will go through. He called you and told you the following information:

(a) Here are the information you were able to get for the first problem:

- the domain is all real numbers
- the function is increasing on $(-\infty, 0)$ and $(3, \infty)$
- the function is decreasing on $(0, 3)$

Can you use the provided information to help him? Support your answers.

(b) Here are the information you were able to get for the second problem:

- the domain is all real numbers except $x = 1$
- the first derivative of the function is zero at $x = \pm 1, 0$
- the function is concave up on $(-\infty, 0)$ and concave down on $(0, \infty)$

Can you use the provided information to help him? Support your answers.

Use this page if you need additional space.