MAC 2233, Spring 2018

Exam #2, ver B

March 1, 2018

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. (8 pts each) Differentiate the following functions and simplify your answers

   (a) $f(x) = (3 - x^5)^3$

   (b) $g(x) = \sqrt{2 + x - x^2}$

2. (4 pts) Suppose the revenue (in cents) of manufacturing q units is $R(q) = \sqrt{q} - 5$. Use marginal analysis to estimate the revenue of selling the 5th unit.

3. (8 pts) Determine the critical numbers of the given function and classify each critical point as a relative maximum, relative minimum, or neither.

$$f(x) = (x^2 - 5)^4$$

4. (8 pts) Sketch a function that has the following properties. On your sketch, identify any inflection point(s) and relative extrema.

- $f'(x) > 0$ when $x \neq 2$
- $f'(x) = 0$ when $x = -2$
- $f''(x) < 0$ when $x < -2$
- $f''(x) > 0$ when $-2 < x < 2$
- $f''(x) < 0$ when $x > 2$

5. (20 pts) Find the intervals where the function is increasing/decreasing, concave up/down and sketch the graph using this information. [Hint: Find the x- and y- intercepts before graphing.]

$$f(x) = \frac{x-2}{x+3}$$

6. (16 pts each) Find the intervals where the function is **increasing/decreasing** and **concave up/down**.

   (a) $f(x) = x^2 - \frac{8}{x}$

   (b) $g(x) = \sqrt{x^2 + 9}$

7. (8 pts) Find the absolute minimum and maximum of the function $f(x) = \dfrac{1}{x^2 - 4}$ in the interval $[-1, 2]$.

8. (7 pts) Is the following statement true or false? Explain **why** and if false, correct the statement.

   To find a relative minimum or maximum of a function, we have to look for the points where the second derivative is zero. If the x-coordinate of the respective point is positive, then the point is a relative maximum. If the x-coordinate of the respective point is negative, then the point is a relative minimum.

9. (7 pts) Is the following statement true or false? Explain **why** and if false, correct the statement.

   An inflection point is a point where the function changes from decreasing to increasing or increasing to decreasing.

Use this page if you need additional space.