MAC 2233, Fall 2018

Exam #2

October 11, 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) $f(x) = \frac{7}{(3-x^2)^2}$

   (b) $g(x) = (3x+1)^4(2x-1)^5$

   (c) $g(x) = (2x^4 - x)^5$

   (d) $g(x) = \sqrt{x^3 + 2x - 21}$

2. (4 pts) Suppose the profit of manufacturing q units is $P(q) = \sqrt{q} - 4$. Use marginal analysis to estimate the profit generated by selling the 17th unit.

3. (4 pts) Suppose the profit of manufacturing q units is $P(q) = 6\sqrt{q} - 1$. Estimate the change in the profit if the production is increased from $q = 9$ to $q = 9.5$

4. (10 pts) Sketch a function that has the following properties. On your sketch, identify any inflection point(s) and relative extrema.

   - $f'(x) < 0$ when $-1 < x < 3$
   - $f'(x) > 0$ when $x < -1$ and $x > 3$
   - $f''(x) < 0$ when $x < 2$
   - $f''(x) > 0$ when $x > 2$

5. (18 pts) Find the intervals where the function is increasing/decreasing, concave up/down, identify the relative min/max and sketch the graph using this information. [Hint: Finding the x- and y-intercepts and asymptotes might be useful.]

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

6. (8 pts each) Find the intervals where the function is **increasing/decreasing** and **concave up/down**.

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

(b) $g(x) = x(x-4)^5$

7. $h(t) = \sqrt{t^2 + 4}$

8. (8 pts) At a certain factory, the total cost of manufacturing q units is $C(q) = 0.3q^2 + q + 50$ dollars. It has been determined that approximately $q(t) = t^2 + 1$ units are manufactured during the first t hours of a production run. Compute the rate at which the total manufacturing cost is changing with respect to time 1 hour after the production begins.

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