Exam #2

October 24, 2017

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!

Revenue function:	$R(x) = p * x$
Profit function:	$P(x) = R(x) - C(x)$
Elasticity of demand:	$E(p) = -\dfrac{p \cdot q'(p)}{q(p)}$
Future value of an investment:	$B(t) = P(1 + \frac{r}{k})^{kt}$ $B(t) = Pe^{rt}$
Effective interest:	$r_e = (1 + \frac{r}{k})^k - 1$ $r_e = e^r - 1$

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

Signature: _____

1. (15 points) Find the intervals where the function is increasing/decreasing, concave up/down and find the relative min/max and inflection points.

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

2. (10 points) Find the critical numbers of the given function and classify each as a relative minimum or maximum

$$f(x) = x^3(x - 2)^2$$

3. (10 points each) Find the intervals where the function is increasing/decreasing

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

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

4. (10 points) Find the elasticity of demand and determine whether the demand is elastic, inelastic, or unitary at the indicated price.

   (a) $q(p) = 240 - 2p; p = 50$

   (b) $q(p) = 300 - p^2; p = 10$

5. (10 points) Differentiate the given function.

   (a) $f(x) = e^{3x+1}$

   (b) $f(x) = 3\log_5 x^2$

6. (10 points) Use the marginal cost to estimate the cost of producing the 6th unit of a commodity if the cost function is
$$C(x) = \frac{1}{2}x^2 - 3x + 110$$

7. (15 points) A citrus grower in Florida estimates that if 100 orange trees are planted, the average yield will be 60 oranges per tree. The average yield will decrease by 2 oranges per tree for each additional tree planted on the same acreage. How many trees should the grower plan to maximize the total yield? [Hint: Use x to denote the number of orange trees and find the total yield as a function of x.]

8. (10 points) Differentiate [Hint: simplify first]

$$f(x) = \ln\left(x^7(x^2+3)^4\right)$$

9. (5 extra credit points) Find the derivative of $f(x) = x^x$.

10. (5 extra credit points) Find the absolute minimum and maximum of the function $f(x) = \dfrac{e^x}{x}$ in the interval $[1, 4]$. [Hint: $e^4 \approx 54.6$]

Use this page if you need additional space.