

Exam #3, ver B

March 29, 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!

Revenue function: $R(x) = p * x$

Profit function: $P(x) = R(x) - C(x)$

Elasticity of demand: $E(p) = -\frac{p \cdot q'(p)}{q(p)}$

Future value of an investment: $B(t) = P(1 + \frac{r}{k})^{kt}$
 $B(t) = Pe^{rt}$

Effective interest: $r_e = (1 + \frac{r}{k})^k - 1$
 $r_e = e^r - 1$

1. (5 pts each) Find the elasticity of demand and determine whether the demand is elastic, inelastic, or unitary at the indicated price.

(a) $q(p) = 75 - p; p = 50$

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

2. (10 pts) It is estimated that the cost of constructing an office building that is n floors high is $C(n) = 3n^2 + 120n + 700$ thousand dollars. How many floors should the building have to minimize **the average cost** per floor?

3. (15 pts) After successful improvement of the revenue from sourdough bread, Joanna's bakery would like to ask you one more time for help. They would like to build a walk-in fridge to keep their produce fresh. The fridge should have a square base and volume of 100 cubic meters. The material for the door costs \$100 per square meter and the material for walls, ceiling and floor costs \$50 per square meter. Find the minimum price for such fridge.

4. (10 pts) Differentiate the given function.

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

(b) $g(x) = \ln(3x + 1)$

(c) $h(x) = x \ln(x)$

5. (16 pts) Find and simplify the second derivative of e^{x^2-3}

6. (10 pts) Use logarithmic differentiation to find the first derivative of $f(x) = (3 - x)^4(x + 4)^5$

7. (9 pts) Bob and Alice want to remodel their bathroom in 4 years. They estimate the job will cost \$20,000. How much must they invest now at an annual interest rate of 4% compounded quarterly to achieve their goal? How much must they invest now if the same interest is compounded continuously? [Leave your answers in a calculator ready form.]

8. (5 extra credit points) Differentiate the function in question 6 without using logarithmic differentiation. Which way is easier? [You don't have to simplify your answer.]

9. (5 extra credit points) Is the following statement true or false? If it is false, explain why.

(a) $\frac{a+b}{a} = \frac{a+b}{a} = \frac{1+b}{1}$ for any b and $a \neq 0$?

(b) The equation $x^2 = 25$ has the solution $x = 5$.

(c) The derivative of e^x is e^x .

(d) The derivative of $\log_2(x)$ is $\frac{1}{x}$.

(e) Business Calculus is a challenging class.

10. (0 pts) How many hours in total did you study for this exam since the weekend?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14+

11. (0 pts) Do you think that you could studied better? Why? Yes No

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