

MATH233 - Unit 3 Derivatives of Exponentials

Individual Project

1. Find the derivative for the following:

a. $y = x^2 e^x$

b. $y = (e^x + 2)^{\frac{3}{2}}$

c. $y = e^{-3x}$

d. $y = \frac{e^x - e^{-x}}{2}$

2. The present value of a building in the downtown area is given by the function

$$P(t) = 300,000e^{-0.09t + \frac{\sqrt{t}}{2}} \text{ for } 0 \leq t \leq 10$$

Find the optimal present value of the building. (Hint: Use a graphing utility to graph the function, $P(t)$, and find the value of t_0 that gives a point on the graph, $(t_0, P(t_0))$, where the slope of the tangent line is 0.)

3. Find the equation of the line tangent to

$$f(x) = xe^{-x},$$

at the point where $x = 0$. What does this tell you about the behavior of the graph when $x = 0$?

4. The unit selling price p (in dollars) and the quantity demanded x (in pairs) of a certain brand of women's shoes are given by the demand equation

$$p(x) = 100e^{-0.0001x} \text{ for } 0 \leq x \leq 20,000.$$

- a. Find the revenue function, R . (*Hint: $R(x) = x(p(x))$* , since the revenue function is the unit selling price at a demand level of x units times the number of units demanded.)
- b. Find the marginal revenue function, R' .
- c. What is the marginal revenue when, $x = 10$?