

Week in Review # 6

MATH 142

Drost-Spring 2010

3.7 Marginal Analysis in Business and Economics

- The price-demand function and the cost function for the production of air-conditioning units is $x = 1500 - 0.25p$ and $C(x) = 60,000 + 200x$.
 - Find the average cost of making 100 units.
 - Find the marginal cost of making 100 units.
 - Find the marginal average cost when $x = 100$.
 - Find the revenue when 100 units are made and sold.
 - Find the average revenue when 100 units are made and sold.
 - Find the revenue of making and selling 25 units.
 - Find the approximate revenue from the 25th unit.
 - Find the marginal average revenue function.
 - What is the profit from making and selling 100 units?
 - What is the marginal profit function.
 - Find the marginal average cost function.
 - How many should they make and sell to maximize revenue?
 - How many should they make and sell to maximize profit?

4.1 Continuous Compound Interest

- The National Trust Company offers an investment at 4.75% per year compounded continuously. If you invest \$30,000 on your 40th birthday, what will the balance be when you turn 65?
- Your insurance company offers an annuity which will be worth \$100,000 when it matures in 30 yrs. If the note pays $8\frac{1}{4}\%$ compounded continuously, how much must one pay now to get this annuity?
- A home purchased for \$160,000 was sold 20 years later for \$245,000. Find the annual rate of interest earned, if the interest is compounded continuously.

4.2 Derivatives of Exponential and Logarithmic Functions

- Find the derivative of $f(x) = e^x - 6 \ln x + 12$
- Find y' when $y = 8^x - 2 \log_5 x$
- Find $\frac{dy}{dx}$ when $y = \ln(2x \cdot e^x)$
- Find the equation of the tangent to the curve $f(x) = e^x + 4x^2 + 3$ at $x = 0$.
- A mathematical model for the average grade on exam 2, of a group of students learning their derivative rules is given by $f(x) = 32 \ln(x + 0.01e^x) + 7$ on the domain is $(0, 7)$. x represents the number of hours spent each week on calculus, and $f(x)$ represents the students average grade.
 - For the student who studies 4 hrs each week, what would this model predict their score would be?
 - What is the expected improvement in your grade if you were studying 4 hr/wk and you increase that 1 hr each week?

4.3 Product and Quotient Rule

- $g(x) = (x^{\frac{2}{3}} + 2x - 5)(x^{\frac{1}{2}} - 7x^{-2} + 6)$, find the derivative.
- $h(x) = \frac{2x^3 - 1}{x^2 + 3}$, find $h'(x)$.
- Given $f(w) = \frac{15\sqrt[3]{w}}{w - 2}$, find $\frac{df}{dw}$.
- Find y' when $y = \frac{\log(x^4)}{\sqrt{x} + \sqrt[3]{x^2}}$. DNS
- Find the derivative of $f(x) = 8^x \left(\frac{x\sqrt[3]{x}}{\sqrt{x^3}} \right)$

4.4 The Chain Rule

- $f(x) = (3x^2 + 1)^4$ Find $f'(x)$.
- Find the values of x where the tangent line is horizontal for $f(x) = \frac{x^2}{(4-x)^3}$.
- $f(x) = e^{4x^2 - 6x + 12}$ Find $f'(x)$.
- $f(x) = \sqrt{x^3 + 11} \cdot e^{x^2 + 4}$ Find $f'(x)$.
- The cost function for Centerville Little League is modeled by $C(x) = \ln(3x^2 + 5x + 12)$. Find $C'(15)$ and interpret. x represents the number of players in the league, and $C(x)$ represents the cost in hundreds of dollars.