

Section 4.2

Section Objectives:

- Know the following derivative rules. Be comfortable using them in a variety of problems. (Only the bottom 2 are new).

function	derivative
$f(x) = c$	$f'(x) = 0$
$f(x) = x^n$	$f'(x) = nx^{n-1}$
$f(x) = e^x$	$f'(x) = e^x$
$g(x) = c \cdot f(x)$	$g'(x) = c \cdot f'(x)$
$f(x) = \ln(x)$	$f'(x) = \frac{1}{x}$
$h(x) = f(x) \pm g(x)$	$h'(x) = f'(x) \pm g'(x)$
$f(x) = g(x)h(x)$	$f'(x) = g(x)h'(x) + g'(x)h(x)$
$f(x) = \frac{g(x)}{h(x)}$	$f'(x) = \frac{h(x)g'(x) - g(x)h'(x)}{(h(x))^2}$

- Know the definitions and interpretations of average cost and marginal average cost.

Practice Problems

1. Evaluate the following derivatives using the rules we learned in this section. (Practice, practice practice!!)

(a) $\frac{d}{dx}(e^x(x^2 - 2x))$

$$(b) \frac{d}{dx}((\ln(x) + 2)(x^5 - \sqrt{x}))$$

$$(c) \frac{d}{dx}(x^3 e^x \ln(x))$$

$$(d) \frac{d}{dx} \left(\frac{x}{x+3} \right)$$

$$(e) \frac{d}{dx} \left(\frac{e^x}{\ln(x) + 2} \right)$$

$$(f) \frac{d}{dx} \left(\frac{\sqrt{x} + \ln(x)}{x e^x} \right)$$

2. The demand equation for a certain product is given by $p = \frac{x+1}{1+x^2}$, where x is the number sold and p is the price. Find the marginal revenue function. Then find $R'(10)$. Give an interpretation of your answer.

3. Derek is setting up a shop to make and sell gumball machines. His costs are given by $C(x) = 3x^2 + \ln(x) - 1$ for $x > 2$ where x is hundreds of gumball machines made.

(a) Find and interpret his marginal cost at $x = 3$.

(b) Find and interpret his average cost at $x = 3$.

(c) Find and interpret his marginal average cost at $x = 3$.

More Practice from Textbook 4.2: You should do as many problems from each set (1-8, 9-12, 13-24, 25-32, 33-44, 45-50 (skip 51-58 and 59-61), as needed until you are comfortable with these techniques. 33-44 are good practice for application problems.