

# Quiz 4, Business Calculus

Summer Session I, 2012

10:52

11:00

Name: Key

1. (3 points) Suppose the relationship between the unit price  $p$  (in dollars) and quantity demanded  $x$  of LeBron James bobbleheads is given by  $p(x) = x - 2$ .

(a) Find the Revenue function  $R(x)$ .

(b) Find the Profit function if  $C(x) = 0.8x^2 + 13.6x - 4$ . Simplify your answer by combining like terms.

(c) Find the Marginal Profit function and compute  $P'(20)$ . What does this number represent and what would it mean for the production of LeBron bobbleheads?

$$(a) R(x) = p(x) \cdot x = \boxed{x^2 - 2x} \quad \checkmark$$

$$(b) P(x) = R(x) - C(x) = x^2 - 2x - (0.8x^2 + 13.6x - 4)$$

$$P(x) = 0.2x^2 - 15.6x + 4 \quad \checkmark$$

$$(c) P'(x) = 0.4x - 15.6 \quad \checkmark$$

$$P'(20) = 8 - 15.6 = -7.6 \quad \checkmark$$

$$P'(40) = 16 - 15.6 = 0.4 \quad \checkmark$$

~~Don't start making profit until you~~

Conclusion: Profit does not start to rise until around 40 bobbleheads. ✓

2. (2 points) Find the second derivative of the function  $f(x) = x(x-3)^4$ . You do not need to simplify your answer, but you must show your work

$$f'(x) = 1 \cdot (x-3)^4 + x(4(x-3)^3) - 1 \quad \checkmark$$

$$f''(x) = 4(x-3)^3 + 1(4(x-3)^3) + x \cdot 12(x-3)^2 \quad \checkmark$$

3. (5 points) Let  $f(x) = \frac{1}{3}x^3 + \frac{5}{2}x^2 - 14x$ .

$$f'(x) = x^2 + 5x - 14 = (x+7)(x-2)$$

(a) Use differentials to estimate the change in  $f$  from  $x = 0$  to  $x = 0.1$ .

(b) Find the  $x$ -values for all maximums and minimums of  $f$ , if any exist. Specify which are maximums and which are minimums.

$$(a) \quad dy = f'(x) dx \quad s=0 \quad dx=0.1$$
$$= (-14)(0.1)$$

$$dy = -1.4$$

$$(b) \quad f'(x) = 0 \quad \text{at } x = -7 \quad \text{and } x = 2$$

