MATH 1520 **Quiz 4** **March 19, 2008**

1. The manufacturer of Lima Lunch Boxes has determined that the demand price for each Lunch Box is given $p = 5x - e^x$.

[1] (a) Determine the revenue function $R(x)$ from the demand price.

> **Solution:**
>
> $$\begin{aligned} R(x) &= xp = x\,(5x - e^x) \\ \text{(or)} \qquad &= 5x^2 - xe^x \end{aligned}$$

[3] (b) Determine the marginal revenue.

> **Solution:**
>
> $$R'(x) = \underbrace{10x}_{[1]} - \Big(\underbrace{(1)(e^x)}_{[1]} + \underbrace{(x)(e^x)}_{[1]}\Big)$$

[4] 2. Winchester Widgets shows a profit of $P(x) = x - \log_{10}(x^2 - 1)$. Find the marginal profit.

> **Solution:**
>
> $$P'(x) = \underbrace{1}_{[1]} - \frac{\overbrace{2x}^{[1]}}{\underbrace{(x^2-1)}_{[1]}\underbrace{(\ln 10)}_{[1]}}$$

3. The manufacturer of Lima Lunch Boxes has determined that the demand price for each Lunch Box is given $p = 2x^2 - e^x$.

[1] (a) Determine the revenue function $R(x)$ from the demand price.

> **Solution:**
>
> $$\begin{aligned} R(x) &= xp = x\left(2x^2 - e^x\right) \\ \text{(or)} \qquad &= 2x^3 - xe^x \end{aligned}$$

[3] (b) Determine the marginal revenue.

Solution:

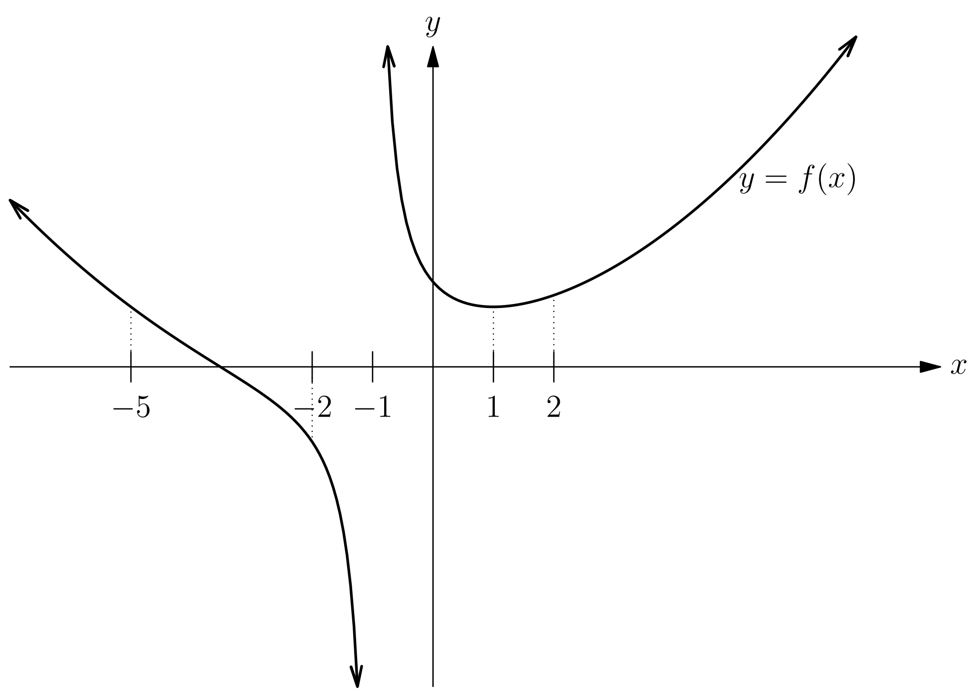
$$R'(x) = \underbrace{6x^2}_{[1]} - \Big(\underbrace{(1)(e^x)}_{[1]} + \underbrace{(x)(e^x)}_{[1]} \Big)$$

[4] 4. Winchester Widgets shows a profit of $P(x) = 5x + \log_3(x^3 - 1)$. Find the marginal profit.

Solution:

$$P'(x) = \underbrace{5}_{[1]} + \frac{\overbrace{3x^2}^{[1]}}{\underbrace{(x^3-1)}_{[1]}\underbrace{(\ln 3)}_{[1]}}$$

5. Below is the graph of a function $y = f(x)$.



[5] (a) Fill in the blanks with either "+", "-", or "0" to indicate if the quantity is positive, negative, or zero:

$f(-2)$ ________

$f'(1)$ ________

$f'(2)$ ________

$f''(1)$ ________

$f''(-2)$ ________

Solution: -, 0, +, +, -

$f(2)$	______
$f'(1)$	______
$f'(-5)$	______
$f''(2)$	______
$f''(0)$	______

Solution: +, 0, -, +, +

$f(2)$	______
$f'(-2)$	______
$f'(-5)$	______
$f''(0)$	______
$f''(-2)$	______

Solution: +, -, -, +, -

$f(2)$	______
$f'(0)$	______
$f'(1)$	______
$f''(-2)$	______
$f''(1)$	______

Solution: +, -, 0, -, +

[2] (b) In the graph of f, there is a vertical asymptote. State the equation of the asymptote and explain *why* this line is an asymptote. (You must use limits for full marks.)

Solution:

$$x = -1 \qquad [1]$$

$$\text{since} \quad \begin{aligned} \lim_{x\to -1^-} f(x) &= -\infty \\ \lim_{x\to -1^+} f(x) &= \infty \end{aligned} \qquad [1]$$

(Only one of the limits is required. Give a bonus mark if they give both.)