MATH 1520 A03 **B10**
March 31, 2008

Tutorial Test 5

Department of Mathematics
University of Manitoba

Student Name	Student ID	/25 Marks

You are given 30 minutes to finish ALL questions; Please show ALL your work to get full credits.

[5] 1. Let

$$f(x) = \frac{2x-1}{x-1}, \qquad f'(x) = \frac{-1}{(x-1)^2}, \qquad \text{and} \qquad f''(x) = \frac{2}{(x-1)^3}$$

Fill in the table with the requested information about f. **GIVE ANSWERS ONLY.** Write "**NONE**" for the item that does not exist.

Domain of f	[1/2]
y-intercept	[1/2]
Equation of the horizontal asymptote(s)	[1]
Open interval(s) where f is decreasing	[1]
Open interval(s) where f is concave upward	[1]
Point(s) of inflection	[1]

See Over

[5] 2. Let

$$f(x) = \frac{x^2}{x+1}, \qquad f'(x) = \frac{x(x+2)}{(x+1)^2}, \qquad \text{and} \qquad f''(x) = \frac{2}{(x+1)^3}$$

Fill in the table with the requested information about f. **GIVE ANSWERS ONLY.** Write "**NONE**" for the item that does not exist.

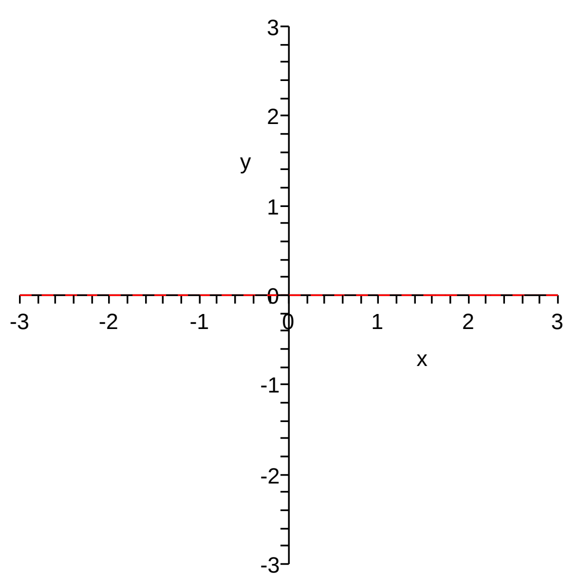
Domain of f	[1/2]
x-intercept	[1/2]
Equation of the vertical asymptote(s)	[1]
Open interval(s) where f is increasing	[1]
x and y-coordinates of the relative maximum	[1]
Open interval(s) where f is concave downward	[1]

3. Consider the function $f(x) = xe^x$. Answer the following questions using the information in the table.

Domain of f/ symmetry	$(-\infty, \infty)$ / NONE
x-intercept/ y-intercept	0 / 0
Horizontal/vertical asymptote	$y = 0$ / NONE
Open interval(s) where f is decreasing	$(-\infty, -1)$
Open interval(s) where f is increasing	$(-1, \infty)$
Critical Point	$(-1, -1/e)$
Open interval(s) where f is concave downward	$(-\infty, -2)$
Open interval(s) where f is concave upward	$(-2, \infty)$
Inflection Point	$(-2, -2/e^2)$

[1] (a) Find all relative maxima and minima, if any, and clearly indicate the x-values that they occur.

[2] (b) SKETCH the graph of $y = f(x)$, **labelling** the horizontal asymptote, the relative maxima/minima and the inflection point. `[ You might want to know that` $2/e^2 < 1/e$. `]`



[7] 4. Find the absolute maximum and minimum values of the function $f(x) = x^3 - 3x - 1$ on the interval [0, 2].

5. If the price charged for a box of "SWEET" candy bar is p dollars, then x boxes will be sold in a centain city, where

$$p = p(x) = 10 - \frac{x}{10}$$

[1] (a) Find an expression for the total revenue $R(x)$ from the sale of x boxes of "SWEET" candy bars.

[3] (b) Find the value of x that leads to maximum revenue. Justify your answer.

[1] (c) Find the maximum revenue.