

STUDENT NAME

STUDENT ID

MARKS

/25

YOU ARE GIVEN 30 MINUTES TO FINISH ALL QUESTIONS; PLEASE SHOW ALL YOUR WORK TO GET FULL CREDITS.

[5] 1. Let

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

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]

[5] 2. Let

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

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

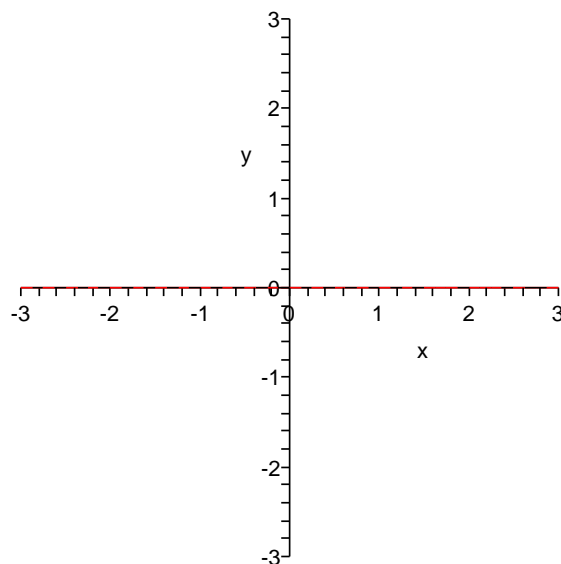
Domain of f	[1/2]
x -intercept	[1/2]
Equation of the vertical asymptote(s)	[1]
Open interval(s) where f is increasing	[1]
x and y -coordinates of the relative maximum	[1]
Open interval(s) where f is concave downward	[1]

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 $f(x) = x^3 - 3x - 2$ 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 certain 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.