SIMON FRASER UNIVERSITY

MATH 157 D100 - CALCU-

[6] 1. (a) Give the three conditions in the definition of the function $f(x)$ being continuous at $x = a$:

(i)

(ii)

(iii)

[4] (b) Let

$$f(x) = \begin{cases} \frac{x^2+4x-5}{x+5} & \text{if } x \neq -5; \\ A & \text{if } x = -5. \end{cases}$$

Find all the values of A so that $f(x)$ is continuous at $x = -5$

show your work.

[10] 2. Let

$$f(x) = \sqrt{x+2}.$$

Use the limit definition of the derivative (i.e., the 4 steps process) to compute $f'(x)$ for $x > 2$.

[10] 3. Use Newton-Raphson method to nd an approximate zero of the equation x

$f(x$

[10] 4. The analysis at a factory showed that during a particular week $C^2 - 3q^3 = 4275$, where the product quantity q is measured in hundred of units and the total cost C of production is in thousands of dollars. Suppose 15 hundred units are being produced and the level of production is increasing at the rate of 2 hundred units per week. At what rate is the cost changing?

a) State the known rate(s) using the given variables and mathematical notation:

b) State the unknown rate using the given variables and mathematical notation:

c) What is the total cost of production when 1500 units are being produced?

d) At what rate is the total cost changing?

e) Interpret your result from part d)!

[8] 5. (a) Given the function

$$f(t) = t^2 e^t;$$

$$f'(t) = (2 + t)te^t; \quad \text{and} \quad f''(t) = (t^2 + 4t + 2)e^t.$$

Find the interval(s) where $f(x)$ is concave upward and the interval(s) where it is concave downward. (Note that $e^t > 0$ for all t.)

[2] (b) Find all the inflection points, if any, of the function $f(t)$ in part (a).

[10] 6. Using theSecond Derivative Test , nd all the relative extrema, if any, of the function

$$f(x) = \frac{x}{(x+3)^2}:$$

[10] 8. Find the following derivatives.

a) Suppose that the functions f and g and their derivatives with respect to x have the values at $x = 0$ and $x = 1$ as shown in the table.

x	f(x)	f'(x)	g(x)	g'(x)
0	5	2	1	3
1	7	-3	-2	-5

Evaluate $\left.\frac{d(f(x+g(x)))}{dx}\right|_{x=0}$!

b) $y = (\sin x)^x$; $\frac{dy}{dx}$ Write in terms of x only!

[10] 9. (GDP of a Developing Country) A developing country's gross domestic product (GDP) from 1993 to 2001 is approximated by the function

$$G(t) = -0.2t^3 + 2.4t^2 + 60, \quad (0 \le t \le 8)$$

where $G(t)$ is measured in billions of dollars and $t = 0$ corresponds to 1993. Show that the growth rate of the country's GDP was maximal in 1997.