Quiz 4

● Graded

Student

Ivan Wang

Total Points

20 / 25 pts

Question 1

Closed Interval Method — 6 / 6 pts

✔ **– 0 pts** Correct. All parts correct.

Question 2

L'Hospital's Rule and Indeterminate Forms — **7** / 8 pts

2.1 **(a)** — **4** / 4 pts

✔ **– 0 pts** Correct. Student correctly applies L'Hospital's rule and evaluates the limit correctly (writes ∞ or $-\infty$ if the limit is infinite)

2.2 **(b)** — **3** / 4 pts

✔ **– 1 pt** After applying L'Hospital's rule, the limit below is evaluated incorrectly

$$\lim_{x\to\infty}\frac{f'(x)}{g'(x)}$$

Question 3

(no title) — **7** / 11 pts

3.1 **(a) Critical numbers** — **2** / 2 pts

✔ **– 0 pts** Correct.

3.2 **(b) Intervals of increase/decrease** — **4** / 4 pts

✔ **– 0 pts** Correct

3.3 **(c) Intervals of concavity** — **1** / 4 pts

✔ **– 3 pts** **None** of the open intervals are correct. Note: it is okay if the student joins two or more open intervals together if f is CU/CD on them

3.4 **(d) x-coordinate(s) for inflection point(s)** — **0** / 1 pt

✔ **– 1 pt** The x-value is incorrect or the student provides more than one x-value

Quiz 4: MTH 141- TR
Worth: 25 points
Time Limit: 25 Minutes

Name: Ivan Way

Student ID: 5 0 4 1 4 3 2 1

Authorized item(s): None. This is a closed-note, closed-book quiz. Calculators are not allowed.

This quiz has 3 questions. Do not write on the backside of the page.

1. (6 points) Use the Closed Interval Method to find the absolute maximum value and the absolute minimum value of the function f on the given interval.

$$f(x) = x^2 - 6x + 4; \quad [0, 2]$$

$f'(x) = 2x - 6 = 0$

$2(x-6) = 0$

$x = 3$ not in given interval

$2x - 6 = 0$

$\frac{2x}{2} = \frac{6}{2}$ $x = 3$

$f(0) = 0 - 0 + 4 = 4$

$f(2) = 4 - 12 + 4 = -4$

The absolute maximum value is $f(0) = 4$. $x = 0$

The absolute minimum value is $f(2) = -4$. $x = 2$

2. (8 points) Find the limit or show it does not exist. You may use L'Hospital's rule if it is applicable.

(a) (4 points) $\lim_{x \to 0} \frac{e^x + 2x - 1}{5x} \Rightarrow \frac{1+0-1}{0} = \frac{0}{0}$

$\frac{gf' - g'f}{g^2}$

$\lim_{x \to a} \frac{f'(a)}{g'(a)} \Rightarrow \frac{e^x + 2}{5} \Rightarrow \frac{e^0 + 2}{5} \Rightarrow \frac{3}{5}$

$\lim_{x \to 0} \frac{e^x + 2x - 1}{5x} = \frac{3}{5}$

(b) (4 points) $\lim_{x \to \infty} \frac{\ln x}{x^2} \Rightarrow \frac{\infty}{\infty}$

$\lim_{x \to a} \frac{f'(a)}{g'(a)} \Rightarrow \lim_{x \to \infty} \frac{\ln x}{x^2} \Rightarrow \lim_{x \to \infty} \frac{\frac{1}{x}}{2x} \Rightarrow$

$\lim_{x \to \infty} \frac{\ln x}{x^2} = \frac{0}{\infty} =$ ONE

$6x$

Name: Ivan Wang Student ID: 5 0 4 1 4 3 2 1

3. (11 points) The first and second derivatives of a polynomial function f are given below.

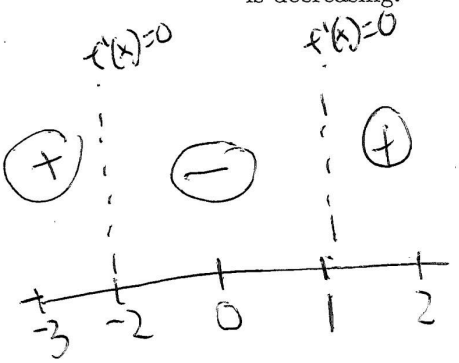
$$f'(x) = (x-1)(x+2)^3; \quad f''(x) = (x+2)^2(4x-1)$$

(a) (2 points) Find the critical numbers of f.

$x-1=0 \quad x+2=0$

Critical values: $x=1, \; x=-2$

(b) (4 points) Find open intervals on which f is increasing and open intervals on which f is decreasing.



$f'(0) = (-1)(2)^3 = -2^3 = -8$

$f'(-3) = (-3-1)(-3+2)^3 = (-4)(-1)^3 = 4^3 = 64$

$f'(2) = (1)(4)^3 = 64$

increasing: $(-\infty, -2) \cup (1, \infty)$

decreasing: $(-2, 1)$

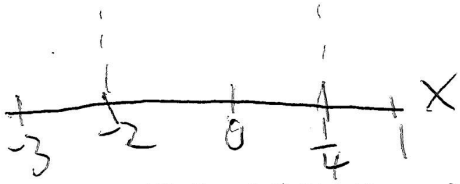
(c) (4 points) Find open intervals on which the graph of f is concave upward and open intervals on which the graph of f is concave downward.

$f''(x) = (x+2)^2(4x-1)$

$x=-2 \quad x=\frac{1}{4}$

$f''(1) = (1+2)^2(4-1) = 27$

$f''(-2) = (-2+2)^2(-8-1) = 0$



(d) (1 point) List the x-value(s) where an inflection point occurs on the graph of f.

inflection points

$x=-2, 1$