

Name: _____
Student ID: SOLUTIONS

Quiz 10

This quiz is graded out of 10 marks. No books or notes are allowed. SHOW ALL YOUR WORK.
If you need more space for your answer use the back of the page.

Question 1. (3 marks)

Find the limit if it exists.

(a) $\lim_{x \rightarrow \infty} \frac{5x^4 - x^2 + 1}{x^5 - 3x^2} = 0$

(b) $\lim_{x \rightarrow -\infty} \frac{12 - 3x^2 + 4x^3}{1 - x - 2x^3} = \frac{4}{-2} = -2$

(c) $\lim_{x \rightarrow \infty} \frac{x^5 + x - 6}{2x^2 + x - 10} \text{ d.n.e}$

YOU CAN USE
THE RULES
ABOUT THE DEGREE
OF THE NUMERATOR
& DENOMINATOR

Question 2. (4 marks)

Find the intervals on which the function $f(x) = x(x-4)^3$ is concave up and concave down and find any inflection points given $f''(x) = 12(x-4)(x-2)$.

$f'' = 0$ At $x=4$ & $x=2$

INTERVAL	$-\infty < x < 2$	$2 < x < 4$	$4 < x < \infty$
test	0	3	5
Sign of f''	$\oplus$	$\ominus$	$\oplus$
Concavity	$\cup$	$\cap$	$\cup$

concavity: Up for $-\infty < x < 2$
& $4 < x < \infty$

down for $2 < x < 4$

Inflection points at $x=2$ & $x=4$

Question 3. (3 marks)
Find all the relative extrema of $f(x) = x^4 - 4x^3 + 2$ using the Second Derivative Test.

$$f'(x) = 4x^3 - 12x^2 = 4x^2(x-3)$$

critical # $x=0$
 $x=3$

$$f''(x) = 12x^2 - 24x = 12x(x-2)$$

when $x=3$ $f''(x) > 0$

So $x=3$ is a

relative min

when $x=0$ $f''(x) = 0$

Test fails

Use 1st der. test

Interval	Test	Sign of f'	incr/decr
$-\infty < x < 0$	-1	(-)	↖
$0 < x < 3$	2	(-)	↖

No relative extrema at $x=0$