MATH 150
Midterm 1, October 6, 2005

Last Name:	
First Name:	
SFU Student ID nr:	
Section Instructor:	R. Pyke

1. DO NOT LIFT UP THE COVER PAGE UNTIL INSTRUCTED.
2. This test is comprised of 9 pages.
3. Once the test begins, please check that all pages are intact.
4. Do ALL questions.
5. Clearly explain your answer. No credit will be given for just writing down the answer.
6. If the answer space provided is not sufficient, write your answer on the back of the previous page. Clearly mark the question number.
7. Ordinary Scientific Calculators ONLY are allowed.
   NO GRAPHING CALCULATORS ALLOWED.
8. The test is out of 30 points.
9. The duration of the test is 50 minutes.
10. Good luck.

1) (4 marks) Evaluate the following limit if it exists. If it does not exist, explain why. You must provide your reasoning which CANNOT be simply "this is what the calculator tells me."

$$\lim_{x\to\infty} x\left[\frac{1}{x}\right]$$

Here, $[x]$ is the greatest integer less than or equal to x (slightly different notation than the text). (So $\left[\frac{1}{x}\right]$ is the greatest integer less than or equal to $\frac{1}{x}$)

Answer

2a) (2 marks) State the Intermediate Value Theorem.

Answer

2b) (4 marks) Use the Intermediate Value Theorem to find an interval of length less than or equal to $\frac{1}{4}$ that contains a root of the equation

$$f(x) = 2x^3 - 3x + 4$$

Explain your answer completely.

Answer

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3) (4 marks) Find the equation of the tangent line to the graph of $f(x) = 2x^2 - \sqrt{x} + 1$ at the point $(1, 2)$.

Answer

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4) (4 marks) Below is the graph of a function $f(x)$. Sketch the graph of the derivative function $f'(x)$ in the space below it (use the axis that are drawn).

Answer

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5) (5 marks) Find all vertical and horizontal asymptotes (if there are any) of the following function;

$$g(x) \;=\; \frac{2\sqrt[4]{x^4}\; - 5x\; + 1}{x^2 + 1}$$

Explain your answers completely.

Answer

6a) (2 marks) Below is the graph of a function $f(x)$ where $\lim_{x\to 2} f(x) = 3$. An ε_1 is given and the interval $|f(x) - 3| < \varepsilon_1$ is indicated.

On the x-axis, indicate an interval $|x - 2| < \delta_1$, for some δ_1, such that if $|x - 2| < \delta_1$, then $|f(x) - 3| < \varepsilon_1$. Explain why your δ_1 works.

Answer

6b) (5 marks) Using the precise $\varepsilon - \delta$ definition of a limit, prove that

$$\lim_{x \to 2} (2x^2 - 3x + 1) \ = \ 3.$$

Answer

Question	Score	Max
1		4
2		6
3		4
4		4
5		5
6		7
Total		30