Math 106-Sec 25X Spring '11 **Exam 1** **Score:** ____________

Name: ______________________________ **TA's Name:** ________________________

Instructions: You must show supporting work as much as possible to receive full and partial credits. No text book, notes, formula sheets allowed.

1(16pts) Use definition to find the derivative function $f'(x)$ of $f(x) = \sqrt{x+1}$. (Any other method receives no credit, and show all work for credit.)

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2(18pts) Find the derivatives of the following functions. (No need to simplify.)

(a) $f(x) = 3\sqrt{\cos x + x^2} - 5\tan(x^2)$

(b) $g(x) = 3^{x^3+1} + \dfrac{x^3+1}{3}$

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3(18pts) Find the limit and side limit analytically. Numerical or graphical work will not be credited.

(a) $\lim_{x \to 0} \dfrac{2x}{\sqrt{x+4}-2}$

(b) $\lim_{x \to 3^+} \dfrac{2-x}{x^3-3x^2}$

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4(16pts) (a) Find all horizontal and vertical asymptotes for the function $y = f(x) = \dfrac{2x^2 - x - 1 + 2}{x^2 + x + 2}$. (Show work to justify your answer.)

(b) Use long division to find the oblique asymptote of the curve $y = \dfrac{3x^3 + 2x^2 + x + 1}{x^2 + 1}$.

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5(16pts) (a) Find all points at which the graph of $y = x^3 - 9x^2 + 24x + 10$ has a horizontal tangent line. You must show analytical work for credit.

(b) For this parametric curve given by $x(t) = t^2, y = \sqrt{t+2}$, find the slope of its tangent line at the point corresponding to $t = 2$.

(c) For the problem of (b) above find an equation for the tangent line at the point corresponding to $t = 2$.

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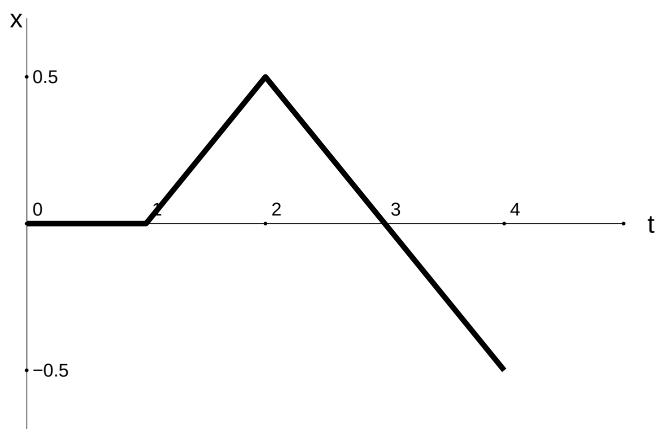
6(16pts) (a) A function f is given by the table below.

x	0	0.1	0.2	0.3	0.4	0.5	0.6
$f(x)$	1.0	0.8	0.7	0.9	1.2	1.4	1.2

Estimate the derivative $f'(0.2)$.

(b) The velocity $v(t)$ of an object moving on a straight line is given by the graph below.



(i) Find the time interval in which the object moves backward.

(ii) Does the object speed up or speed down at $t = 2.5$?

(iii) Find the moment at which the object makes a U-turn.

(iv) Sketch the graph for the acceleration function $a(t)$ wherever exists.

2 Bonus Points: Your TA's last name is ________________. (*Page 6 ... and The End*)