MTH 132 - 10/02/98 FIRST MIDTERM	Fall 98 A. Corso	Name: ______________________ ______________________

PLEASE, BE NEAT AND SHOW ALL YOUR WORK; CIRCLE YOUR ANSWER.

Problem Number	Possible Points	Points Earned
1	15	
2	20	
3	10	
4	20	
5	10	
6	15	
7	10	
TOTAL	100	

1. (a) (5pts) Define the derivative of $f(x)$ at $x = x_0$.

   (b) (10pts) Use the definition given in (a) to compute the derivative of

$$f(x) = \frac{1}{1-x}$$

   at any point $x \neq 1$.

pts: /15

2. Evaluate the following limits (5pts each)

(a) $\displaystyle\lim_{x\longrightarrow 1}\left(\frac{x^2-3x+2}{2x^2-2}\right) =$ ____________________

(b) $\displaystyle\lim_{h\longrightarrow 0}\frac{\cos(\frac{\pi}{2}+h)-\cos(\frac{\pi}{2})}{h} =$ ____________________

(c) $\displaystyle\lim_{x\longrightarrow 0}\frac{\sin(2x)}{x^2+3x} =$ ____________________

(d) $\displaystyle\lim_{x\longrightarrow 0^+} g(x) =$ ____________________ where $g(x)=\begin{cases} 1-x^2 & x<0 \\ 2 & x=0 \\ 3+x & x>0 \end{cases}$

pts: /20

3. (a) Consider the equation

$$x^5 + 5x^3 + 1 = 0$$

Show that the equation has one root in $[-1, 0]$.

(b) What does the Intermediate Value Theorem say?

pts: /10

4. Find $\frac{dy}{dx}$ in each of the following (5pts each)

$(a)\ \ y=(x^2+1)(5x-x^2)$ $\qquad\frac{dy}{dx}=$ __________________

$(b)\ \ y=\frac{1-x+2x^2}{\sin x}$ $\qquad\frac{dy}{dx}=$ __________________

$(c)\ \ y=x^2\cos x$ $\qquad\frac{dy}{dx}=$ __________________

$(d)\ \ y=\frac{1}{2x^2}+3\tan x$ $\qquad\frac{dy}{dx}=$ __________________

pts: /20

5. Graph the function

$$g(x) = \begin{cases} 1 - x^2 & x < 0 \\ 2 & x = 0 \\ 3 + x & x > 0 \end{cases}$$

already considered in Problem 2 (d). Is $g(x)$ continuous at $x = 0$? If your answer is no, can you change the value of $g(x)$ at $x = 0$ to make $g(x)$ continuous at $x = 0$? Explain!

pts: /10

6. Find the points $P(x_0, y_0)$ where the curve

$$y = x^3 - 3x - 2$$

has horizontal tangent (i.e. derivative equal to zero).
Find the equation for the horizontal tangent at those points.

pts: /15

7. Explorers on a small airless planet used a spring gun to launch a ball bearing vertically upward from the surface at a launch velocity of 15 m/sec. Because the acceleration of gravity at the planet's surface was g_s m/sec^2 (g_s is constant), the explorers expected the ball bearing to reach a height of

$$s(t) = 15t - \frac{1}{2}g_s t^2 \qquad \text{meters}$$

t seconds later.

The ball bearing reached its maximum height 20 seconds after being launched. What was the value of g_s?

pts: /10