NAME:

SECTION # OR TA'S NAME:

CALCULUS 106 – FIRST MIDTERM EXAM – MARCH 4, 2002

Please attempt all the problems and show all your work. Don't hesitate to ask me for clarification on any questions you may have. You may **not** *use any notes, books or calculators.*

1 . Compute the following limits (5 points each):

(i) $\lim_{x\to 0} \dfrac{\sqrt{1+x}-\sqrt{1-x}}{x}$

(ii) $\lim_{w\to 0^+} \dfrac{1-\cos\sqrt{w}}{\sin(2w)}$

(iii) $\lim_{x\to\infty} \dfrac{2e^x+3x^2e^{-x}}{3e^x+4x^4e^{-x}}$

2 . (15 points) Find the equation of the line tangent to the graph of the equation:

$$y^2(2-x)+xy=x^3+1$$

at the point $(1,1)$.

3 . (15 points) Does the function $f(x) = 4x + e^{-x}$ have a zero? Justify your answer (Note: the value of e is $\simeq 2.7$).

4 . Compute derivatives of the following functions (5 points each):

(i) $\dfrac{x}{x+1}$

(ii) $\cot x \ \left(= \dfrac{\cos x}{\sin x}\right)$

(iii) $x^{\ln x}$

5 . (20 points) Find the derivative of the inverse function $f^{-1}(y)$ at the point $y = 2$, where the function is given by: $f(x) = e^x - e^{-x} + 1/2$.

6 . (20 points) You are driving on an east/west highway where the speed limit is 65 mph. Unknown to you, there is a highway patrol officer stationed .3 miles south of an intersection you are approaching. The officer has a powerful radar pointed directly at you. She takes a measurement and notes that you are half a mile away, closing in at a speed of 60 mph. Should she give you a ticket?