MA 141H-14, Honors calculus - I, Dr Chernov Test II Wed, Oct 27, 1999 Show your work! Student's name or SSN: Differentiate the following functions: 1. (5 pts)

 $y = e^{-x}(1 - 2x)^8 - \sqrt[6]{12x - 5}$ 

2. (5 pts)

$$y = e^{\tan^{-1}\sqrt{t^4 - 1}}$$

3. (6 pts) Find the first and the second derivatives of the function

$$r = \frac{\sin\theta}{1 + \cos\theta}$$

4. (7 pts) Find  $y^{(99)}$ , where

 $y = \cos 2x - \sin 2x$ 

5. (8 pts) Find the lines that are (a) tangent and (b) normal to the curve

$$x^2 + e^{xy} - 2\tan^{-1}y = 2$$

at the point x = 1, y = 0.

6. (5 pts) Find the following limit:

$$\lim_{x \to \infty} \frac{2x + (\ln x^7)^2}{e^{2\ln x} - x^2 - x}$$

7. (4 pts) Differentiate the function

$$y = \frac{(x-2)^{3/2}(3-x)^{1/3}}{(2x+1)^{150}}$$

For extra credit, do the following problems: (6 pts) Differentiate the function

$$y = (1 + \ln x)^{\sqrt{\tan x}}$$

(8 pts) Find the following limit:

$$\lim_{x \to \infty} \left( 1 - \frac{4}{x - 10} \right)^{2x}$$

(8 pts) Find the limit (justify your work!)

$$\lim_{x \to 0+} x^{\sqrt{x}}$$

(6 pts) Differentiate

$$y = x^{2^{x-1}}$$