MA125 Exam 2

Name:

1) Find the derivative of the following function and its domain:

$$h(x) = 1 - \sin x \cdot \sec x$$

2) Find the slope of the line tangent to the curve

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

at $\theta = 3\pi/2$.

3 A stone is dropped into a still pond creating a circular wave that expands away from the center at a rate of 50 centimeters per second. Find the rate of change of the **area** inside the circle after:

a) 1 second
b) 3 seconds
c) 5 seconds

4) Find the derivative of the following function directly from the definition of the derivative as a limit:

$$f(x) = 1 + \sqrt{x+3}$$

5) Find the horizontal and vertical asymptotes of the function

$$g(x) = \frac{2x^2 + x - 1}{x^2 + x - 2}$$

6) Find the equation of the line tangent at $x = 0$ to the function $(f \cdot g)(x)$ given that

$$f(x) = 3x^2 + 1 \quad \text{and} \quad g(x) = \cos x$$

7) A particle moves along a straight line. If its position after t seconds is given by

$$s = 4t^3 - 9t^2 + 6t + 2$$

a) What is the particle's velocity at time $t = 0$?
b) What is the particle's acceleration at time $t = 1$?
c) At what time(s), if any, is the particle at rest?
d) At what time(s), if any, is the particle neither accelerating nor decelerating?

8) Find the derivative of

$$f(x) = \frac{1 + \sin x}{1 + e^x}$$

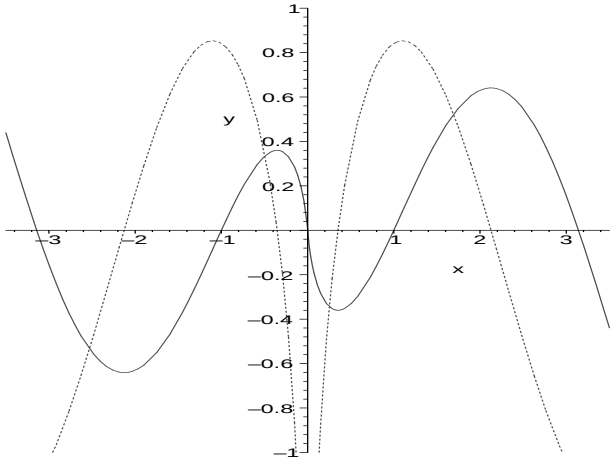
What is the equation of the line tangent to $f(x)$ at $x = 0$?

9) A function is defined piecewise by

$$f(x) = \begin{cases} x^2 + bx + c & x < 0 \\ 1 + \sin x & x \geq 0 \end{cases}$$

a) What value of c makes f continuous at $x = 0$?
b) What values of b and c make f continuous and differentiable at $x = 0$?

10) Given the following graphs of $f(x)$ and $f'(x)$,



a) Identify which curve is $f(x)$ and which is $f'(x)$.

b) Identify the intervals on which $f(x)$ is increasing

c) Identify the intervals on which $f(x)$ is decreasing

d) Identify the intervals on which the **second derivative** $f''(x)$ is positive

e) Identify the intervals on which the **second derivative** $f''(x)$ is negative

f) Identify the point(s) at which f is not differentiable