92-131 **Final Exam** **Spring 2010**

Name_____ **Brent Sect. 203**

Determine the derivative of the following functions:

1) $s(x) = \csc(x^3)$ **(5 pts)**

2) $f(x) = e^{\tan^{-1} x^2}$ **(5 pts)**

3) $y = \sin(\pi x)\cos(\pi x)$ **(10 pts)**

4) $g(t) = \dfrac{t^2 - 1}{t^3 + 1}$ **(10 pts)**

5) $y = x^{-5}(5\ln x + 1)$ **(5 pts)**

6) $g(x) = \left(x^2 + 2x + 4\right)^{10}$ **(5 pts)**

7) Using the limit definition of the derivative, calculate $\dfrac{d\,f}{d\,x}$ for $f(x) = 3x^2 + 4x$. **(10 pts)**

8) Compute the derivative of the function $g(t) = [\sin(t)]^{\,t}$ **(10 pts)**

9) Suppose a ball is moving on a linear track so that its acceleration (in m/s^2) is given by:

$$a(t) = 4 - 6t^2, \text{ for } t \geq 0,$$

where *t* is time in seconds. The ball has initial position $s(0) = 0$ m, and initially at rest. **a**) What is the ball's velocity after 3 seconds? **b)** When does it reverse direction? **c)** What is the ball's position $s(t)$ at any time *t*? **(10 pts)**

10) Let $f(x) = x^2 e^{-x}$.

a) Find the interval(s) on which *f* is increasing or decreasing.
b) Find local (relative) maximum and minimum values of *f*.
c) Determine intervals where the function is concave up and concave down.
d) Are there any asymptotes? **(10 pts)**

11) Find the dimensions of the cylinder of largest volume that can be inscribed in a sphere of radius 1 ft **(10 pts)**

12) There is one positive value of *x* that solves the equation $x^2 - 2 = 0$.

a) Write down the recursion equation for solving this problem using Newton's method.

b) Starting with $x_0 = 2$, use Newton's Method to approximate the solution by x_2.

(Round to 10^{-6}) **(10 pts)**