NAME_____

I____ II_____III_____ IV_____ V_____ VI___ VII___ VIII_____IX___TOTAL _____
  (16)   (9)   (15)   (10)   (12)   (12)   (5)   (16)   (5)   (100)

November 9   Mathematics 105D
Mr. Haines   Calculus I
2012   Examination #2

(16) I. Compute $\frac{dy}{dx}$ for the following:

      A. $y = e^{\sin x}$

      B. $y = (\sin x)^e$

      C. $y = x^{\sin x}$

      D. $y = x \arctan(5x)$.

(9) II. $2x^2y - y^2 = y$

    A. Prove that $(1, 1)$ is a point on this curve.

    B. What is $\frac{dy}{dx}$ at the point $(1,1)$?

    C. What is the equation of the tangent line to this curve at the point $(1,1)$?

(15) III. Suppose that $f(x) = x^2 e^x$ with domain $[-10, 10]$.

A. Find the x-value(s) of all roots of f.

B. Find the x- and y- values of all critical points and identify each as local max, local min, or neither.

C. Find the x- and y- values of all global extrema and identify each as a global max or a global min.

D. Find the x-values of all inflection points.

E. Sketch f.

(10) IV. Suppose that $y = f(x) = \ln(e^{\sin x})$.

A. $f'(x) =$

B. $f''(x) =$

C. $\dfrac{d^2 y}{dx^2} =$

(12) V. A box with a square top and bottom has a volume of 32 cubic inches. You are to do the first few steps to determine which dimensions will produce the least expensive box if the cost of the top and bottom is 2 cents per square inch and the cost of the sides is 1 cent per square inch. It may help to draw a picture the box.

    A. List the variables you would use in setting up this problem and describe them.

    B. What is the objective function?

    C. What is the constraint equation?

    D. Use the constraint equation to write the objective function as a function of one variable. You can stop here and don't need to optimize this function!

(15) VI. Suppose that $f(x) = \arcsin x$

    A. Give the value of $f(0)$ in radians.

    B. Give a formula for $f'(x)$?

    C. What is the value of $f'(0)$?

    D. Give the equation of the tangent line to the graph of $y = \arcsin x$ at the point $(0, f(0))$.

(5) VII. Suppose that $f(x) = \frac{2^x - e^x}{e^x}$.

Give a formula for $f'(x)$.

(16) VIII. Find the following limits:

A. $\lim_{x \to \infty} (x - 5)(7 - x)$

B. $\lim_{x \to \infty} \frac{x+5}{3-x}$

C. $\lim_{x \to 0} \frac{x^2+1}{3x}$

D. $\lim_{x \to \infty} \frac{\ln x}{x}$.

(5) IX. What is the minimum value of the expression $x^2 + y^2$ if $x + y = 4$?