EXAM 3 - MATH 151 Friday, November 4

YOUR NAME:______________________ George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Gravel is being dumped from a conveyor belt at a rate of 30 ft^3/min, and its coarseness is such that it forms a pile in the shape of a right circular cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 feet high?

   [Recall that the volume of a right circular cone, with base radius r and height h, is given by $V = \frac{1}{3}\pi r^2 h$.]

2. Compute the limits (you must show full work):

   (a) $\lim_{x\to 2^+} e^{3/(2-x)}$

   (b) $\lim_{x\to(\pi/2)^+} e^{\tan x}$

3. (a) Compute the derivative of $f(x) = \ln\left(x^2 e^x + 2012x\right)$.

(b) Find an equation for the tangent line to $y = (2 + x)e^{-x}$ at $x = 0$.

4. Use logarithmic differentiation to compute the derivative of

$$f(x) = \frac{(x^2 + 1)^4}{(2x + 1)^3(3x - 1)^5}.$$

5. Compute the following limits (you must show full work):

(a) $\lim_{x\to+\infty}(x^3e^{-x})$

(b) $\lim_{x\to(\pi/2)^-}(\tan x)^{\cos x}$