**Math 106-Sec 15X Spring '11** **Exam 2** **Score:** _____

**Name:** _____ **TA's Name:** _____

**Instructions:** You must show supporting work as much as possible to receive full and partial credits. No text book, notes, formula sheets allowed.

**1(18pts)** Let $y = f(x) = x^5 + 37x$.

(a) Find an equation for the tangent line of the function $y = f(x)$ at $x = 1$.

(b) Find the value of $dy$ when $x = 1$ and $\Delta x = 0.2$.

(c) It is given that for a function $y = g(x)$, $g(2) = 1, g'(2) = 0.2$. Approximate the value $g(1.8)$ and justify your answer.

(*Page 1 and Continue on to Next Page ...* )

**2(16pts)** Sand falls from a conveyor belt as the rate of 10 $m^3$/min onto the top of a conical pile. The height of the pile is always three-eighths of the base diameter. How fast is the radius changing when the pile is 4 m high?

(*Page 2 and Continue on to Next Page ...* )

**3(16pts)** Find the absolute extrema of the function $y = f(x) = x^{4/5}(5-x)$ in the interval $[-1, 1]$. (Calculator read-off answers receive no credit.)

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**4(16pts)** Find the following limits. (Calculator read-off answers receive no credit.)

(a) $\lim_{x \to 0^+} \dfrac{\ln(x^2 + 2x)}{\ln x}$

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

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**5(18pts)** The first and second derivatives of the function $y = xe^{1/x}$ are given as

$$y' = e^{1/x}\left(1 - \frac{1}{x}\right), \qquad y'' = \frac{e^{1/x}}{x^3}$$

Sketch the graph of the function, including these information: intercept points, horizontal and vertical asymptotes, extrema and intervals of monotonicity, inflection points and intervals of concavity. (Calculator read-off answers receive no credit.)

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**6(16pts)** A rectangle has its base on the $x$-axis and its upper two vertices on the parabola $y = 12 - x^2$. What is the largest area the rectangle can have, and what are its dimensions?

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**2 Bonus Points**: True or False: Test 3 will be on a Tuesday. ____ (*Page 6 ... and The End*)