Math 1A – Calculus – Chapter 4 Test – Spring 07   Name_____________________
Show work for credit. Don't abuse a calculator.

1. A bug is crawling along the curve $y = \sqrt[3]{x}$ so that as the bug passes through the point (27, 3) its x-coordinate increases at a rate of 0.2 cm/s.
   a. How fast is the y-coordinate increasing?
   b. How distance from the bug to the origin changing at this instant?

2. Two sides of a triangle have lengths 3 and 4. How fast is the angle between them changing when the opposite side is equal to 5? Recall that the law of cosines involves the formula $a^2 = b^2 + c^2 - 2bc\cos\theta$.

3. Sketch the graph of a function on [0,5] that has no global maximum nor minimum, two local minima, one local maximum and four critical numbers.

4. Find the inflection points of $y = x^2 e^{3x}$.

5. Suppose $f(x) = (x+2)^2 (x-7)^3 (x-11)^4$. On what intervals is f increasing? Write your answer using interval notation.

6. Use your calculator to examine the graph of $f(x) = \tan x + 5\sin x$ as well as the graphs of $f'(x)$ and $f''(x)$.
   a. How many local extrema are in each period?
   b. How many intervals of increase are in each period?
   c. How many inflection points are in each period?

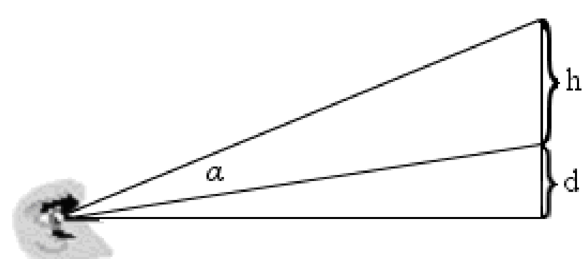
7. Find $\lim_{x\to 0} \dfrac{e^{5x} - 1 - \sin x}{x^2 + x}$ using L'Hospital's rule, if appropriate.

8. For what values of a and b is the following true: $\lim_{x\to 0} \dfrac{\sin 6x}{x^3} + a + \dfrac{b}{x^2} = 0$?

9. If $y = x^2 - x + 1$, what value will minimize the product xy on the interval [0, 2] ?-

10. Find the points on the ellipse $9x^2 + y^2 = 9$ which are farthest from the point (0, 3).

11. A painting in an art gallery has height h and is hung so that the lower edge is a distance d above the eye of the observer. How far from the wall should the viewer stand so as to maximize the angle α the painting subtends at the viewer's eye?



12. Use Newton's method to approximate $\sqrt[3]{1729}$ accurate to 8 decimal places. Start with $x_1 = 8$ and show the iteration formula and the iterates up to convergence.