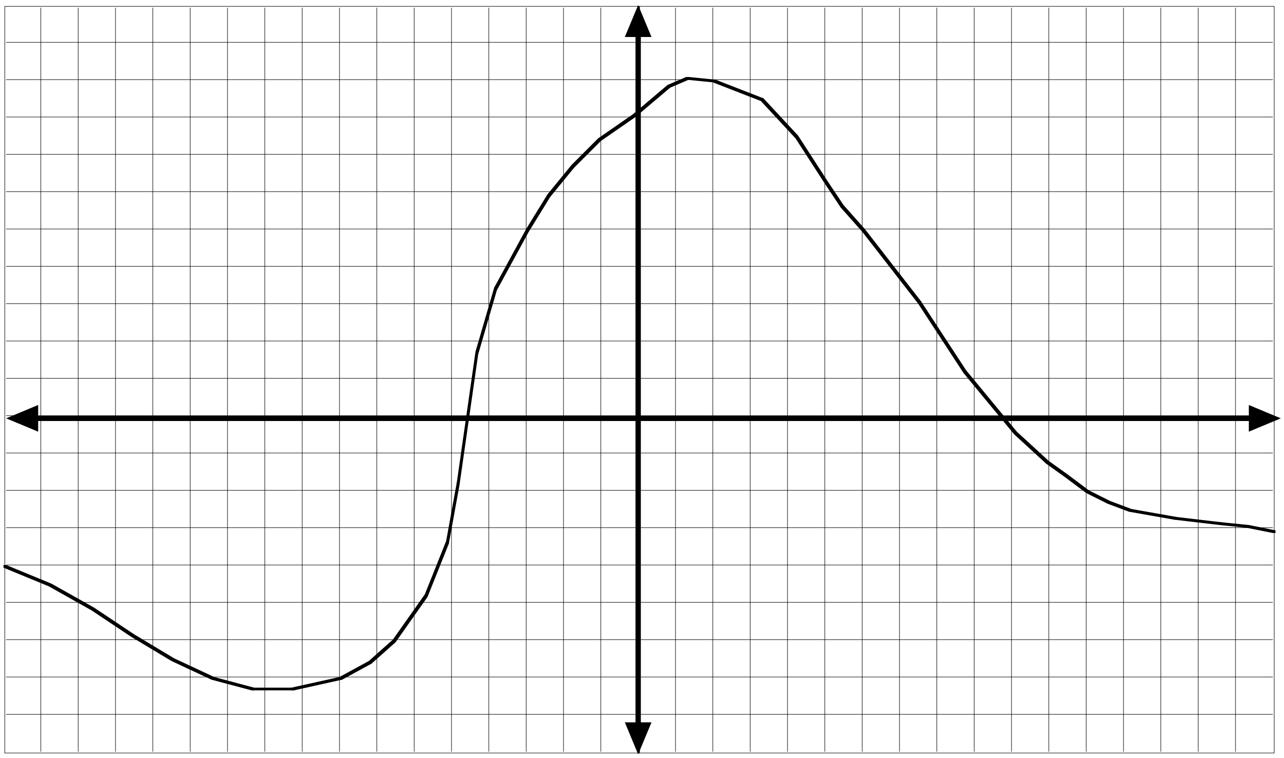
Name: ________________________

Problem Set 3
SHOW ALL WORK FOR CREDIT
You may submit solutions on a separate sheet of paper if you prefer.

Assigned: 12/13/07 Due: 12/21/07 (2 pts off for each day late)

1.



a) Where is the maximum value of this function?

b) Where is the minimum value of this function?

c) Over what interval(s) is the derivative positive?

d) Over what interval(s) is the derivative negative?

e) Where is the derivative zero?

f) If this is a position versus time graph, where is the object moving the fastest?

Where is it slowing down?

Where does it stop and turn around?

g) Explain in your own words why the maximum and minimums of functions occur where the derivative is zero.

2. a) How many “humps” does a line have?

b) How many “humps” does a parabola (2nd degree function) have?

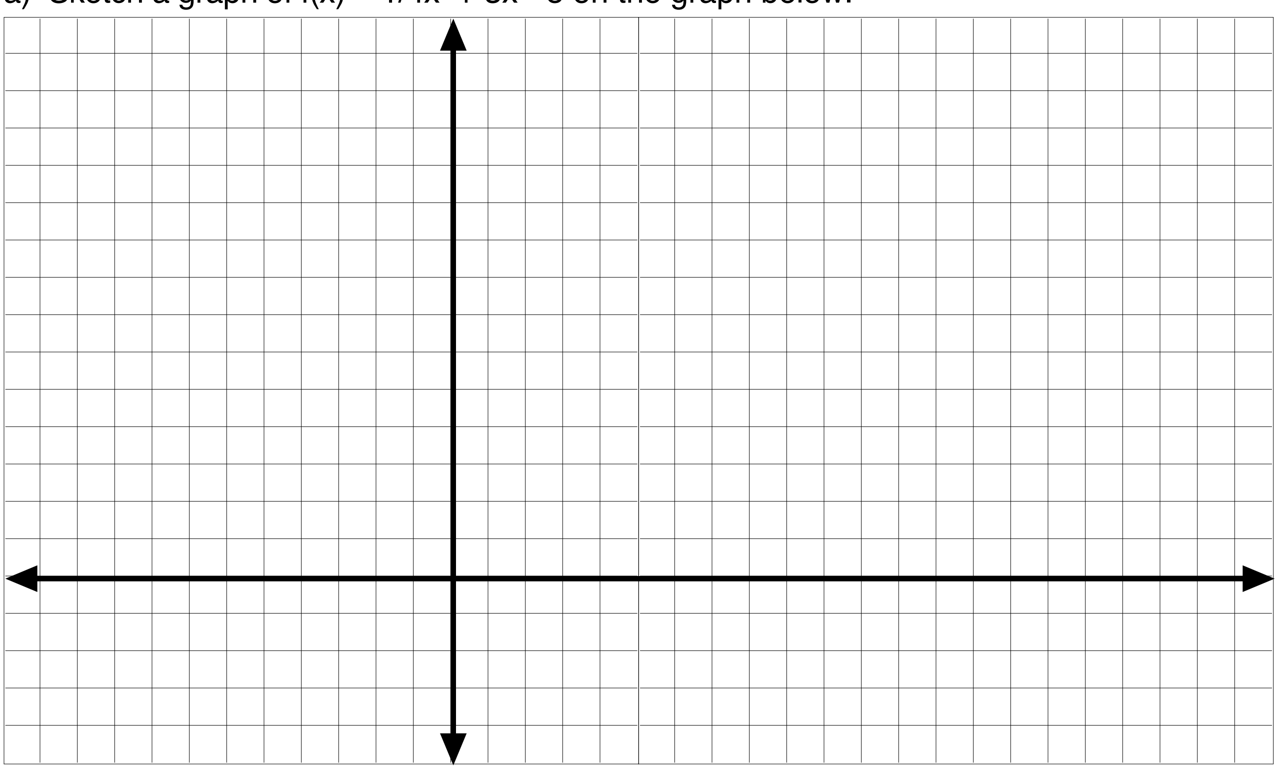
c) How many “humps” can a a cubic function (with an x^3 term) have?

d) The general form of a cubic function is $y= ax^3 + bx^2 + cx + d$. Write a formula for where to find the maxima and minima of a cubic function in terms of a, b, c, and d.

e) How many solutions does (d) yield? ____ How does this answer relate to your answer in (c) ?

f) Hypothesize the number of “humps” (maxima or minima) that are possible in a function of degree **n** (meaning the highest exponent is x^n)

3. a) Sketch a graph of $f(x) = 1/4x^2 + 3x - 5$ on the graph below.



b) Use the graph to predict where the derivative is positive and where it is negative.

c) Use calculus to find the minimum of the function.

d) Graph the derivative of the function on the same graph.

i) How does this graph relate to your answer in part (b)?

ii) How does this graph relate to your answer in part (c) ?

4. Use calculus to find the maxima and minima of $y = x^3 - 5x^2 + 3x - 6$. Show all your work.

5. The sum of two numbers is 18. Maximize their product using calculus.

6. Find the point on the graph $y = -1/2x + 10$ that is closest to the origin using calculus.

7. A point (x, y) is a distance of 5 units from the origin. Maximize x^2y^2.