Lab 1: Antiderivatives

In this lab you will do several problems that will help you practice working with and applying antiderivatives. Do the problems neatly in pencil on a **separate** piece of paper and staple your pages. Clearly lay out your work using proper notation and circle/highlight/box your final answer. **Problems with just an answer and no work will not receive credit.** You are encouraged to work groups of 2 to 4 people. If you do work with more than one person, you only need to hand in one lab write-up per group; make sure you put everyone's name on it. This lab is worth 40 points. This is due next **Wednesday, July 2.**

1. (10 pts) An object that is thrown vertically upward (or dropped) has a constant acceleration that is determined by gravity: -32 ft/sec^2, or -9.8 m/sec^2. We use negative values here since the acceleration is *downward*. A rock is dropped off the edge of a 400-foot-high cliff.
    a) Find its acceleration function $a(t)$. Then use it and the other information given to find $v(t)$ and $s(t)$, where the position function measures height above the ground. Make sure you include units.
    b) How long does it take the rock to hit the ground, and how fast is it traveling at that moment?

2. (8 pts) A ball is thrown vertically upward from a height of 2 meters with an initial velocity of 10 m/sec.
    a) Find its position function $s(t)$.
    b) How high does the ball get, and how long does it take to reach that height?

3. (8 pts) A baseball is thrown vertically upward from the roof of a 100-meter-high building. It hits the street below eight seconds later.
    a) What was the initial velocity of the baseball?
    b) How high did it rise above the street before beginning its descent?

4. (8 pts) Find the function f whose derivative is $f'(x) = x^3$ and who has $x + y = 0$ as a tangent line.

[One more on the other side!]

5. (6 pts) The graph of a function f is given below. There is an antiderivative of f that passes through the point (0, 7). What is the equation of the tangent line *to this antiderivative* at $x = 0$? Verbally explain how you found your solution.