First written homework, due Monday January 21

1. Write down the definition of a definite integral.

2. Explain what an indefinite integral is, and how it is different from an anti-derivative.

Problems 3-6 are a re-run of a problem from last semester's final (whose solutions are now disabled).

3. A model rocket is shot into the air. The rocket fires for 2 seconds, during which time its (vertical) acceleration is 30 (in units of meters per second squared). After that, the vertical acceleration is -10, thanks to gravity. That is

$$a(t) = \begin{cases} 30 & \text{when } 0 < t < 2 \\ -10 & \text{when } t > 2 \end{cases}$$

Assuming that the rocket started off motionless ($v_0 = 0$) at time $t = 0$, compute the rocket's velocity as a function of time. Do this using anti-derivatives, making sure that the initial value of the velocity is right and that the velocity is continuous.

4. Now compute the velocity by integration: $v(t) - v(0) = \int_0^t v'(s)ds$.

5. Using anti-derivatives, determine how high off the ground will the rocket be at time $t = 8$.

6. Solve problem 5 using a definite integral rather than by computing $x(t)$ for all t.

7. Stewart Section 5.3 (page 395), problem 60.

8. Stewart Section 5.4 (page 405), problems 64 and 67