1. Definition: If $g'(x) = h(x)$, then we say $h(x)$ is an antiderivative of $g(x)$.
   (a) In general, do functions have unique antiderivatives? Can you think of more than one antiderivative for $f(x) = x^2$?
   (b) Suppose $g'(x) = h(x)$. How can you write the most general antiderivative for $g(x)$? (This is usually what people mean when they say the antiderivative of a function.)
   (c) From the basic definition and all the derivatives you already know, you now know a whole list of antiderivatives. To test the concept, for the following functions, write down the most general antiderivative:
      i. $f(x) = cos(x)$
      ii. $f(x) = \dfrac{1}{1+x^2}$
      iii. $f(x) = x^n$ (careful - does this depend on what $n$ is?)
2. Another way to write "the most general antiderivative of $f(x)$" is to write $\int f(x)dx$. (We will discuss this notation more later). Find the following indefinite integrals (a.k.a. antiderivatives). You may have to put in a little bit of thought - the idea is to find what function you could differentiate in order to get each of these functions. Remember to check your answer by differentiating.
   (a) $\int 2\,dx$
   (b) $\int (9-x)^2\,dx$
   (c) $\int \sin(9x+5)\,dx$
   (d) $\int (4\theta + \cos 8\theta)\,d\theta$
   (e) $\int te^{t^2}\,dt$
3. Suppose $F$ is an antiderivative of $f$, and $G$ is an antiderivative of $g$, that is, $F'(x) = f(x)$ and $G'(x) = g(x)$. For each of the following, show that it must be true or give a counterexample to show it is false.
   (a) If $f = g$ then $F = G$.
   (b) If $F$ and $G$ differ by a constant, then $f = g$.
   (c) If $f$ and $g$ differ by a constant, then $F = G$.
4. Suppose that $F$ is an antiderivative of $f$, that is, $F'(x) = f(x)$.
   (a) Show that $\frac{1}{2}F(2x)$ is the antiderivative of $f(2x)$.
   (b) Find the general antiderivative of $f(kx)$ for any constant $k$.
   (c) What is the general antiderivative of $f(kx+a)$ for constants $k$ and $a$?
5. A car traveling at 84 ft/sec begins to decelerate at a constant rate of 14 ft/sec$^2$. After how many seconds does the car come to a stop and how far will the car have traveled before stopping?