SECTION 5-4: INDEFINITE INTEGRALS AND THE NET CHANGE THEOREM

1. Compute $\int x^2(3-x)\,dx$

2. Compute $\int 9\sqrt{x} - 3\sec(x)\tan(x)\,dx$

3. Find an antiderivative of $f(x) = \frac{1}{x^2}$ that does not have the form $-1/x + C$.

4. Snow is falling on my garden at a rate of

$$A(t) = 10e^{-2t}$$

kilograms per hour for $0 \le t \le 2$, where t is measured in hours.

(a) Find $A(1)$ and interpret in the context of the problem.

(b) If $m(t)$ is the total mass of snow on my garden, how are $m(t)$ and $A(t)$ related to each other?

(c) What does $m(2) - m(0)$ represent?

(d) Find an antiderivative of $A(t)$.

(e) Compute the total amount of snow accumulation from $t = 0$ to $t = 1$.

(f) Compute the total amount of snow accumulation from $t = 0$ to $t = 2$.

(g) From the information given so far, can you compute $m(2)$?

(h) Suppose $m(0) = 9$. Compute $m(1)$ and $m(2)$.

5. A airplane is descending. Its rate of change of height is $r(t) = -4t + \frac{t^2}{10}$ meters per second.

   (a) if $A(t)$ is the altitude of the airplane in meters, how are $A(t)$ and $r(t)$ related?

   (b) What physical quantity does $\int_1^3 r(t)\, dt$ represent?

   (c) Compute $A(3) - A(1)$.

   (d) What is the height of the plane when $t = 3$?

6. Gravel is being added to a pile at a rate of rate of $1 + t^2$ tons per minute for $0 \leq t \leq 10$ minutes. If $G(t)$ is the amount of gravel (in tons) in the pile at time t, compute $G(10) - G(0)$.