1. Compute $\displaystyle\int_1^2 \frac{t^3 - 3t^2}{t^4}\, dt$.

2. Compute $\displaystyle\frac{d}{dx}\int_5^x \cos(\sqrt{s})\, ds$.

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

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

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

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

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

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

b. What does $m(2) - m(0)$ represent?

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

d. Compute the total amount of snow accumulation from $t = 0$ to $t = 1$.

e. Compute the total amount of snow accumulation from $t = 0$ to $t = 2$.

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

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

6. 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 $A(3) - A(1)$.

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

8. Challenge! Compute

$$\frac{d}{dx}\int_5^{x^3} \cos(\sqrt{s})\,ds.$$

Hint: Let $H(x) = \int_5^x \cos(\sqrt{s})\,ds$. You're interested in $H(x^3)$. Apply the Chain Rule!

9. Challenge! Compute

$$\frac{d}{dx}\int_x^{x+1} \sqrt{s^2+1}\,ds.$$