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

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

**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 $0 \le t \le 2$, 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 $r(t) = -4t + \dfrac{t^2}{10}$ 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 $\displaystyle\int_1^3 r(t)\,dt$ 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

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