

### **Integrating Acceleration: Exercise**

Case #2:  $a = f(t)$

**Acceleration** of a particle is given by

$$a(t) = 2t - 10$$

where  $a$  is in meters per second squared and  $t$  is in seconds.

Determine the **velocity** and **position** as functions of time. The initial **position** is  $s_0 = -4$  m at  $t = 0$ , and the initial **velocity** is  $v_0 = 3$  m/s.

---

$$\frac{2/5}{v} \quad a = \frac{dv}{dt} = 2t - 10$$
$$\int_{v_0=3}^v dv = \int_0^t (2t - 10) dt, \quad \underline{v = 3 - 10t + t^2 \text{ (m/s)}}$$
$$\frac{ds}{dt} = 3 - 10t + t^2$$
$$\int_{s_0=-4}^s ds = \int_0^t (3 - 10t + t^2) dt$$
$$\underline{s = -4 + 3t - 5t^2 + \frac{1}{3}t^3 \text{ (m)}}$$