

1. A particle moves with acceleration  $a(t) = t - 2 \text{ m/s}^2$  along an  $s$ -axis and has velocity  $v_0 = 0 \text{ m/s}$  at time  $t = 0$ . Find the displacement and distance traveled by the particle over the interval  $1 \leq t \leq 5$ .

Motion that occurs when an object near the Earth is imparted some initial velocity (up or down) and thereafter moves along a vertical line is called **free-fall motion**. The position and velocity functions for a particle in free-fall motion are

$$s(t) = s_0 + v_0 t - \frac{1}{2} g t^2 \quad \text{and} \quad v(t) = v_0 - g t$$

where  $g$  is the acceleration due to gravity, which is approximately  $32 \text{ ft/s}^2$  (or  $9.8 \text{ m/s}^2$  if we were using metric units). Use these facts to solve the following problem.

2. A projectile is launched vertically upward from ground level with an initial velocity of  $112 \text{ ft/s}$ .

- a) Find the velocity at  $t = 3$  seconds.
- b) How high will the projectile rise?
- c) Find the speed of the projectile when it hits the ground.