

2. Find the velocity and position vectors of a particle that has the given acceleration and the given initial velocity and initial position.

$$\vec{a}(t) = \mathbf{k}, \quad \vec{v}(0) = \mathbf{i} - \mathbf{j}, \quad \vec{r}(0) = \mathbf{0}$$

$$\vec{v}(t) = \langle 1, -1, t \rangle$$

ANS

$$\vec{r}(t) = \langle t, -t, \frac{t^2}{2} \rangle$$

ANS

3. Find the velocity and position vectors of a particle that has the given acceleration and the given initial velocity and initial position.

$$\vec{a}(t) = -10\mathbf{k}, \quad \vec{v}(1) = \mathbf{i} + \mathbf{j} - \mathbf{k}, \quad \vec{r}(1) = \mathbf{i} + \mathbf{k}$$

$$\vec{v}(t) = \langle 1, 1, 9 - 10t \rangle$$

ANS

$$\vec{r}(t) = \langle t, t-1, -5t^2 + 9t - 3 \rangle$$

ANS

Problem Solving Problems

1. A projectile is fired with an initial speed of 500m/s and an angle of elevation 30° . Find the range of the projectile, the maximum height reached, and the speed at impact.

$$\text{Range} = 22,092.3 \text{ m}$$

ANS

$$\text{Max Height} = 3,188.78 \text{ M}$$

ANS

$$\text{Speed} = 500 \frac{\text{M}}{\text{S}}$$

ANS,

2. Rework the previous problem if the projectile is fired from a position 200m above the ground.

$$\text{Range} = 22,433.6 \text{ m}$$

ANS

$$\text{Max Height} = 3,388.78 \text{ m}$$

ANS

$$\text{Speed} = 503.9 \frac{\text{m}}{\text{s}}$$

ANS

3. A ball is thrown at an angle of 45° to the ground. If the ball lands 90m away, what was the initial speed of the ball?

$$V_0 = 29.6785 \frac{\text{m}}{\text{s}}$$

ANS

4. A gun has muzzle speed 150m/s . Find two angles of elevation that can be used to hit a target 800m away.

$$\theta_1 = 10.1961^\circ$$

$$\theta_2 = 79.8039^\circ$$

ANS

5. A batter hits a baseball 3ft above the ground toward the center field fence, which is 10ft high and 400ft from home plate. The ball leaves the bat with speed 115ft/s at an angle of 50° above the horizontal. Is it a home run? (In other words does the ball clear the fence?)

$$y_f = 8.27\text{ft}$$

Not A Home Run

ANS.