

**Topic:** Position, velocity, and acceleration**Question:** Find the velocity function.

$$x(t) = 4t^2 - 6t + 2$$

**Answer choices:**

A  $v(t) = 8t - 4$

B  $v(t) = 8t + 6$

C  $v(t) = 4t - 6$

D  $v(t) = 8t - 6$



**Solution: D**

Take the derivative of the position function.

$$x(t) = 4t^2 - 6t + 2$$

$$x'(t) = 8t - 6$$

Velocity is the derivative of position.

$$v(t) = 8t - 6$$



**Topic:** Position, velocity, and acceleration

**Question:** Find the position of a car when its velocity is zero.

$$x(t) = 4t^2 - 8t + 10$$

**Answer choices:**

- A  $x = 6$
- B  $x = 7$
- C  $x = 10$
- D  $x = 0$



**Solution: A**

Take the derivative of the position function.

$$x(t) = 4t^2 - 8t + 10$$

$$x'(t) = 8t - 8$$

Velocity is the derivative of position.

$$v(t) = 8t - 8$$

We need to find time when velocity is 0.

$$8t - 8 = 0$$

$$8t = 8$$

$$t = 1$$

Velocity is 0 when  $t = 1$ . To find position at the same time, substitute  $t = 1$  into the position function.

$$x(1) = 4(1)^2 - 8(1) + 10$$

$$x(1) = 4 - 8 + 10$$

$$x(1) = 6$$



**Topic:** Position, velocity, and acceleration

**Question:** Use the position function to find the velocity of a rocket at  $t = 4$ .

$$x(t) = 6t^3 - t^2 + 3t - 9$$

**Answer choices:**

- A  $v(4) = 238$
- B  $v(4) = 371$
- C  $v(4) = 283$
- D  $v(4) = 317$



**Solution: C**

Take the derivative of the position function.

$$x(t) = 6t^3 - t^2 + 3t - 9$$

$$x'(t) = 18t^2 - 2t + 3$$

Velocity is the derivative of position.

$$v(t) = 18t^2 - 2t + 3$$

We need to find velocity when  $t = 4$ , so we'll plug  $t = 4$  into the velocity function we just found.

$$v(4) = 18(4)^2 - 2(4) + 3$$

$$v(4) = 288 - 8 + 3$$

$$v(4) = 283$$

