**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.

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

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

$$v(4) = 283$$