Chapter 3 Problem 86 [†]

Given
$x(t) = 2.0 - 4.0t^2$

Solution
a) What is the velocity as a function of time?

The definition of velocity is

$$v = \frac{dx}{dt}$$

Substitute in the function for position and take the derivative

$$v = \frac{d}{dt}\left(2.0 - 4.0t^2\right)$$

$$v = -4.0(2)t$$

$$v = -8.0t$$

b) What is the acceleration as a function of time?

The definition of acceleration is

$$a = \frac{dv}{dt}$$

Substitute in the function for velocity and take the derivative

$$a = \frac{d}{dt}\left(-8.0t\right)$$

$$a = -8.0$$

The acceleration of the particle is a constant.

[†]Problem from University Physics by Ling, Sanny and Moebs (OpenStax)