

## Chapter 7 Problem 28 <sup>†</sup>

### Given

$$U = 1.6x^2 - 4$$

### Solution

a) Find the force when the particle is at  $x = 2.1 \text{ m}$ .

The relationship between force in the  $x$  direction and the potential energy is

$$F_x = -\frac{dU}{dx}$$

Substitute in the potential function given for this problem we get a force of

$$F_x = -\frac{d(1.6x^2 - 4)}{dx} = -(1.6(2x) - 0) = -3.2x \quad (1)$$

Substituting in the value of  $x = 2.1 \text{ m}$  gives

$$F_x = -3.2(2.1 \text{ m}) = -6.72 \text{ N}$$

b) Find the force when the particle is at  $x = 0 \text{ m}$ .

Use equation (1) and substitute in  $x = 0 \text{ m}$ .

$$F_x = -3.2(0 \text{ m}) = 0 \text{ N}$$

c) Find the force when the particle is at  $x = -1.4 \text{ m}$ .

Use equation (1) and substitute in  $x = -1.4 \text{ m}$ .

$$F_x = -3.2(-1.4 \text{ m}) = 4.48 \text{ N}$$

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<sup>†</sup>Problem from Essential University Physics, Wolfson