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§ 3.4 4

In Class Exercise

④  $f(t) = t^4 - 4t + 1$

a) Find velocity at time  $t$ .

$$v(t) = \frac{ds}{dt} = 4t^3 - 4$$

b) What is the velocity after 5s.

$$v(5) = 4(5)^3 - 4 \\ = 104 \text{ ft/sec}$$

c) When is the particle at rest?

The particle is at rest when  $v(t) = 0$ , that is,

$$4t^3 - 4 = 4(t^3 - 1) = 0$$

and that is true when  $t = 1$ .  $\therefore$  the particle is at rest after 1s.

d) When is the particle moving in the positive direction?

The particle moves in the positive direction when  $v(t) > 0$ , that is,

$$4(t^3 - 1) > 0$$

This inequality is true when  $t > 1$ , thus the particle moves in the positive direction in the time interval  $t > 1$ .

e) Find the total distance traveled in the first 8s.

Calculate distance traveled in time intervals,  $[0, 1]$ ,  $[1, 8]$

$$|f(1) - f(0)| = \cancel{24} \quad 3$$

$$|f(8) - f(1)| = 4067 \text{ ft.}$$

$$\text{So total distance} = 4067 \text{ ft} + (2 \text{ ft}) = \cancel{4065} \text{ ft.} \quad 4070$$

f) Draw a diagram illustrating the motion of the particle.

