

Quiz # 6 — 10/13/16

Answer all questions in a clear and concise manner. Remember that answers without explanation or that are poorly presented may not receive full credit.

1. Let V be the volume of a box with a square base of side length x and height h . If the box expands upwards as time passes (x is constant), find dV/dt in terms of dh/dt .

(a) $\frac{dV}{dt} = x^2 \frac{dh}{dt}$

(b) $\frac{dV}{dt} = x \frac{dh}{dt}$

(c) $\frac{dV}{dt} = x^2 h \frac{dh}{dt}$

(d) $\frac{dV}{dt} = xh \frac{dh}{dt}$

(e) $\frac{dV}{dt} = 2xh + x^2 \frac{dh}{dt}$

2. The position of a particle is given by the equation

$$s = f(t) = t^3 - 8t^2 + 24t$$

where t is measured in seconds and s in meters. Find the acceleration after 3 seconds. Is the particle speeding up or slowing down at that time? Support your answer.

The velocity is the derivative of the position function.

$$v(t) = \frac{ds}{dt} = 3t^2 - 16t + 24$$

The velocity after 3 seconds is $v(3) = 3(3)^2 - 16(3) + 24 = 3m/s$.

Now the acceleration is the derivative of the velocity function.

$$a(t) = \frac{d^2s}{dt^2} = 6t - 16$$

The acceleration after 3 seconds is $a(3) = 6(3) - 16 = 2m/s^2$.

Since the acceleration and velocity have the same sign, the particle is speeding up.