2017 AB/BC #1
(calculator-active)

(a)

$$\text{Volume} = \int_0^{10} A(h)\,dh$$
$$\approx (2-0)A(0) + (5-2)A(2) + (10-5)A(5)$$
$$= 2(50.3) + 3(14.4) + 5(6.5) \text{ ft}^3 \text{ or } 176.3 \text{ ft}^3$$

(b)

It was given that if h increases from 0 to 10 ft, then $A(h)$ decreases on that interval. Hence the left Riemann sum in part (a) is an **overestimate** of the volume of the tank.

(c)

$$\text{Volume} = \int_0^{10} f(h)\,dh \approx 101.3253382 \text{ ft}^3 \text{ or } 101.325 \text{ ft}^3$$

(d)

$$V(h) = \int_0^h f(t)\,dt$$
$$\frac{dV}{dt} = f(h)\left(\frac{dh}{dt}\right)$$
$$\left.\frac{dV}{dt}\right|_{h=5} = f(5) \bullet (0.26) \approx 1.694418562 \ \frac{\text{ft}^3}{\text{min}} \text{ or } 1.694 \ \frac{\text{ft}^3}{\text{min}}$$