Exercise 103

A company purchases some computer equipment for \$20,500. At the end of a 3-year period, the value of the equipment has decreased linearly to \$12,300.

a. Find a function $y = V(t)$ that determines the value V of the equipment at the end of t years

b. Find and interpret the meaning of the x- and y-intercepts for this situation.

c. What is the value of the equipment at the end of 5 years?

d. When will the value of the equipment be \$3000?

Solution

Part (a)

Because the equipment value decreases linearly, the function representing it is a line.

$$V(t) = mt + b$$

Two points on this line are needed to determine m and b. One is initially (at $t = 0$ the value is \$20,500), and the second is after three years (at $t = 3$ the value is \$12,300).

$$20500 = m(0) + b$$

$$12300 = m(3) + b$$

Solve this system of equations for m and b.

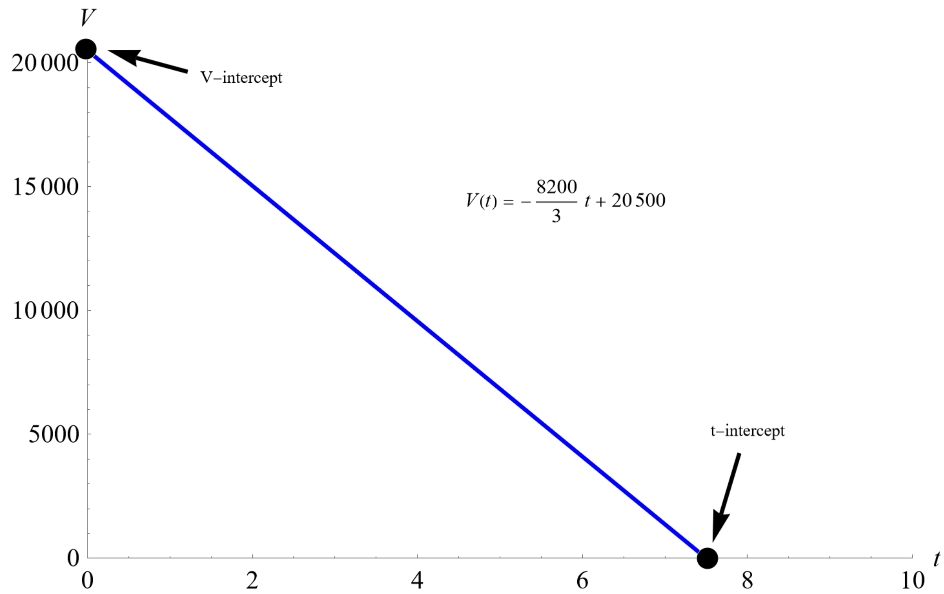
$$b = 20500$$

$$m = -\frac{8200}{3}$$

Therefore,

$$V(t) = -\frac{8200}{3}t + 20500.$$

Below is a graph of $V(t)$ versus t.



Part (b)

The t-intercept is the point where the line crosses the t-axis, and the V-intercept is the point where the line crosses the V-axis.

$$0 = -\frac{8200}{3}t + 20500 \quad \rightarrow \quad t = 7.5 \text{ years} \quad \Rightarrow \quad t\text{-intercept}: \quad (7.5, 0)$$

$$V = -\frac{8200}{3}(0) + 20500 \quad \rightarrow \quad V = 20500 \text{ dollars} \quad \Rightarrow \quad V\text{-intercept}: \quad (0, 20500)$$

The t-intercept is how long it takes for the value to drop to \$0, and the V-intercept is the value initially (at $t = 0$).

Part (c)

To find the value of the equipment at the end of 5 years, plug in $t = 5$ into the formula for V.

$$V(5) = -\frac{8200}{3}(5) + 20500 = \frac{20500}{3} \approx \$6833.33$$

Part (d)

To find the time for the value to reach \$3000, plug in $V = 3000$ and solve the equation for t.

$$V(t) = -\frac{8200}{3}t + 20500 = 3000$$

$$-\frac{8200}{3}t = -17500$$

$$t = \left(-\frac{3}{8200}\right)(-17500) = \frac{525}{82} \approx 6.40 \text{ years}$$