Exercise 220

A race car is accelerating at a velocity given by $v(t) = \frac{25}{4}t + 54$, where v is the velocity (in feet per second) at time t.

a. Find the velocity of the car at 10 sec.

b. Find the inverse function.

c. Use part b. to determine how long it takes for the car to reach a speed of 150 ft/sec.

Solution

Part (a)

Plug in $t = 10$ to the given function for $v(t)$ to determine the car's velocity at 10 seconds.

$$t = 10 \qquad \Rightarrow \qquad v(10) = \frac{25}{4}(10) + 54 = 116.5 \ \frac{\text{ft}}{\text{sec}}$$

Part (b)

Solve the given function,

$$v(t) = \frac{25}{4}t + 54,$$

for t.

$$v = \frac{25}{4}t + 54$$

$$v - 54 = \frac{25}{4}t$$

$$4(v - 54) = 25t$$

$$\frac{4}{25}(v - 54) = t$$

Therefore, the function that converts from velocity to time is

$$v^{-1}(v) = \frac{4}{25}(v - 54).$$

Part (c)

Plug in $v = 150$ to the inverse function to find how long it takes to reach a speed of 150 ft/sec.

$$v = 150 \qquad \Rightarrow \qquad v^{-1}(150) = \frac{4}{25}(150 - 54) = 15.36 \text{ sec}$$

Therefore, it takes 15.36 seconds for the car to reach a speed of 150 ft/sec.