Problem 2.55 from text.

The acceleration of an object is given as:

\[ a = 3s^2 \ [\text{ft/sec}^2] \]

Initial conditions: \( s_0 = 0 \), \( V_0 = 10 \ \text{ft/sec} \)

What is velocity when \( s = 4 \ \text{ft} \)?

Notice that the acceleration is a function of \( s \). Therefore, Equation 8 from our notes may come in handy.

\[ \int_{V_0}^{V} v \, dv = \int_{s_0}^{s} a(s) \, ds \]

Plug in the values we have:

\[ \int_{10}^{V} v \, dv = \int_{0}^{s} 3s^2 \, ds \]

\[ \frac{1}{2} v^2 \bigg|_{10}^{V} = s^3 \bigg|_{0}^{s} \]

\[ \frac{1}{2} (V^2 - 10^2) = s^3 - 0 \]

\[ \therefore V^2 = 2s^3 + 100 \]

So, when \( s = 4 \ \text{ft} \), \( V^2 = 2 \cdot 4^3 + 100 = 228 \)

Take square root \( \Rightarrow V = \sqrt{228} \ \text{ft/sec} \)