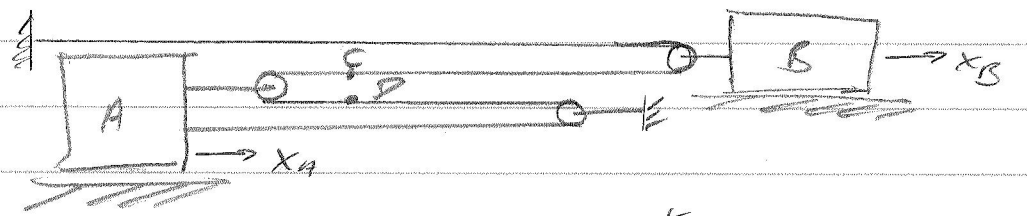
11.55: Beer, Johnston & Clausen

Find: a_A, a_B, a_D when A is 10 in to the right
V_B and X_B after 4 s.

Use: Relative motion and constant accel eqns



Known

$-3x_A + 2x_B = 0$ $\qquad$ $V_{B_0} = 6$ in/s

$x_A = \frac{2}{3} x_B$ $\qquad$ $V_A(10) = 2.4$ in/s

$\therefore \quad V_{A_0} = \frac{2}{3} V_{B_0} = 4$ in/s

$a_A \Delta t = \Delta V_A$

$a_A \Delta t = -1.6$ in/s, $a_A = \frac{-1.6}{\Delta t}$ (1)

Const accel means

$\Delta x_A = V_{A_0} \Delta t + \frac{1}{2} \Delta t^2 a_A$

$10 = 4 \Delta t + \frac{1}{2} a_A \Delta t^2$ (2)

$10 = 4 \Delta t + \frac{1}{2}(-1.6) \Delta t$

$\Delta t = \frac{10}{4 - .8} = 3.125$ sec

$a_A = \frac{-1.6}{3.125} = \underline{-0.512 \text{ in/s}^2}$

$a_B = \frac{3}{2} a_A = \underline{-0.768 \text{ in/s}^2}$

$a_D = -a_A$, so $\underline{a_D = 0.512 \text{ in/s}^2}$

$V_B(4) = 6 + 4 a_B = \underline{2.93 \text{ in/s}}$

$\Delta x_B = 6.4 + \frac{1}{2} 4^2 a_B = \underline{17.86 \text{ in}}$