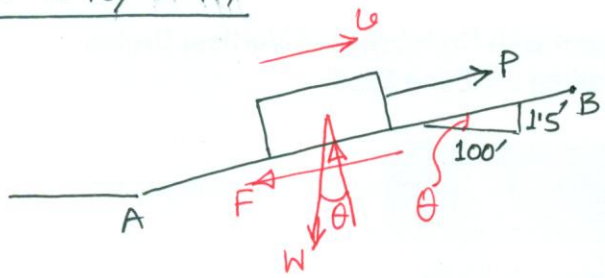
#1390/P.417



$W = 3000 \text{ ton} = 3000 \times 2000 \text{ lb}$

$F = 14 \times 3000 \text{ lb} = 42000 \text{ lb}$

$P = 135000 \text{ lb}$

$v_B = 80 \text{ fps}$

$S_{AB} = 1 \text{ mile} = 1760 \times 3 \text{ ft}$

$v_A = ?$

Soln

For the train to move from A to B

$$U_{net} = (P - F - W \sin\theta) \times S_{AB}$$

$$= \left(135000 - 42000 - 3000 \times 2000 \times \frac{1.5}{\sqrt{1.5^2 + 100^2}}\right) \times 1760 \times 3 \text{ ft-lb}$$

$$= 15893450.98 \text{ ft-lb}$$

$$\Delta KE = \frac{1}{2} \cdot \frac{W}{g} \left(v_B^2 - v_A^2\right)$$

$$= \frac{1}{2} \times \frac{3000 \times 2000}{32.2} \left(80^2 - v_A^2\right)$$

$$= 93167.7 \times \left(80^2 - v_A^2\right)$$

Now $U_{net} = \Delta KE$

$$\Rightarrow 15893450.98 = 93167.7 \left(80^2 - v_A^2\right)$$

$$\therefore v_A = \boxed{78.93 \text{ fps.}} \quad \text{Ans.}$$