PHYSICS MATH SKILLS III - SOLUTIONS

1. $d = \bar{v}\,t$ $\qquad \bar{v} = \frac{v_i + v_f}{2}$

$$d = \left(\frac{v_i + v_f}{2}\right)t$$

2. $\frac{F_A - F_f}{m} = \frac{\cancel{m}a}{\cancel{m}}$

$$a = \frac{F_A - F_f}{m} \qquad F_f = \mu F_N$$

$$a = \frac{F_A - \mu F_N}{m} \qquad F_N = mg$$

$$a = \frac{F_A - \mu m g}{m}$$

3. $d = v_i t + \frac{1}{2}at^2$

$$d = v_i t - \frac{1}{2}\mu g t^2$$

$$\frac{-F_f}{m} = \frac{\cancel{m}a}{\cancel{m}}$$

$$a = -\frac{F_f}{m} \qquad F_f = \mu F_N$$

$$a = -\frac{\mu F_N}{m} \qquad F_N = mg$$

$$a = -\frac{\mu \cancel{m} g}{\cancel{m}}$$

$$a = -\mu g$$

4. $\Delta p = F\Delta t$ $\qquad$ $\Delta p = m\Delta v$

$m\Delta v = F\Delta t$ $\qquad$ $\Delta v = v_f - v_i$

$$\frac{\cancel{m}(v_f - v_i)}{\cancel{m}} = \frac{F\Delta t}{m}$$

$$v_f - \cancel{v_i} = \frac{F\Delta t}{m} \quad \cancel{+v_i} \quad +v_i$$

$$v_f = v_i + \frac{F\Delta t}{m}$$

5. $E_i = E_f + Q$ $\qquad$ $E_i = E_p$ $\qquad$ $E_f = E_k$

$E_p = E_k + Q$ $\qquad$ $E_p = mgh$ $\qquad$ $E_k = \frac{1}{2}mv^2$

$$mgh - Q = \frac{1}{2}mv^2 + \cancel{Q} \quad \cancel{-Q} \quad -Q$$

$$(mgh - Q) \times 2 = \cancel{\frac{1}{2}}mv^2 \quad \cancel{\times 2} \quad \times 2$$

$$\frac{2(mgh - Q)}{m} = \frac{\cancel{m}v^2}{\cancel{m}}$$

$$\sqrt{\frac{2(mgh - Q)}{m}} = \sqrt{v^2}$$

$$v = \sqrt{\frac{2(mgh - Q)}{m}}$$

6. $F_T - F_g = ma$ $\qquad F_g = mg$

$F_T - \cancel{mg}^{+mg} = ma^{+mg}$

$F_T = ma + mg$

$\frac{F_T}{a+g} = \frac{m\cancel{(a+g)}}{\cancel{a+g}}$

$m = \frac{F_T}{a+g}$ $\qquad a = \frac{v_f^2}{2d}$

$v_f^2 = v_i^2 + 2ad$ $\qquad v_i = 0$

$\frac{v_f^2}{2d} = \frac{\cancel{2}a\cancel{d}}{\cancel{2d}}$

$m = \frac{F_T}{\frac{v_f^2}{2d} + g \times \frac{2d}{2d}}$

$m = \frac{F_T}{\frac{v_f^2}{2d} + \frac{2dg}{2d}}$

$m = \frac{F_T}{\frac{v_f^2 + 2dg}{2d}}$

$m = \frac{2dF_T}{v_f^2 + 2dg}$