

1.

$$a. \vec{r} = 3.00t\hat{i} - 6.00t^3\hat{j}$$

$$\vec{v} = \frac{d}{dt}\vec{r} = \underline{3.00\hat{i} - 18.00t^2\hat{j}}$$

b.

$$\underline{\frac{d}{dt}\vec{v} = -36.00t\hat{j} = \vec{a}}$$

c.

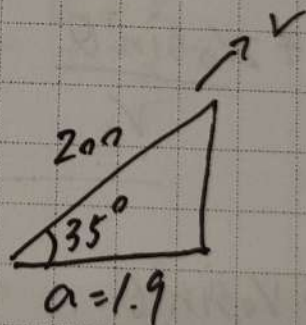
$$t=1 \quad \vec{r} = 3.00\hat{i} - 6.00\hat{j}$$

$$\vec{v} = 3.00\hat{i} - 18.00\hat{j}$$

2.

a.

$$\frac{1}{2}at^2 = 200 \quad v = 27.57$$



$$200\sin 35^\circ + \frac{1}{2}g\left(\frac{v_y}{g}\right)^2 = 200\sin 35^\circ + \frac{(27.57\sin 35^\circ)^2}{9.8} \approx 149.23$$

$$A: 149.23m$$

b.

$$200\cos 35^\circ + v_x \left(\frac{2v_y}{g} + 20\sqrt{\frac{\sin 35^\circ}{g}} \right) \approx 346$$

$$A: 346m$$

3.

a. $72.0 = (6.0 + 12.0)a \quad a = 4.0 \quad A: 4.0 \text{ m/s}^2$

b. $12.0 \times 4.0 = 48.0$

A: 48.0 N

c. $72.0 - 48.0 = 24.0$

A: 24.0 N

4.

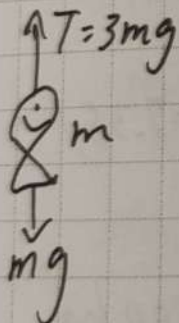
$9.800g - F = 6.00$

$9.84 - 6.00 = F \quad F = 1.84$

$9.800g + F = 9.68$

A: 9.68 N

5.



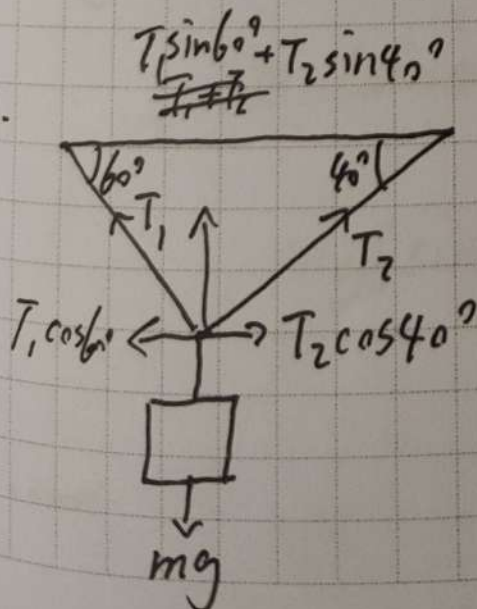
~~$T = 2.2 \times 3.0 = 6.6$~~

$\frac{T - mg}{m} = 2g = 19.6$

A: 19.6 m/s^2

6.

a.



b.

$$T_1 \sin 60^\circ + T_2 \sin 40^\circ = mg$$

$$T_1 \cos 60^\circ = T_2 \cos 40^\circ$$

$$T_1 = 2T_2 \cos 40^\circ$$

$$T_2 (2 \cos 40^\circ \sin 60^\circ + \sin 40^\circ) = mg$$

$$T_2 \doteq \frac{mg}{1.99} \leq 5000 \quad mg = 9850$$

~~$$m = 1005$$~~

$$A = 9850 \text{ N}$$

7.

$$f = 5.00g \times 0.750 = ma$$

$$a = 7.35$$

$$(5 + 8 + m_c) 7.35 = m_c g$$

$$13 + m_c = \frac{m_c g}{7.35}$$

$$13 = \frac{m_c (9 - 7.35)}{7.35}$$

$$95.55 = m_c (9.80 - 7.35)$$

~~$$m_c$$~~
$$m_c = 39.00$$

$$A = 39.00 \text{ kg}$$

8

~~$$mg = cv^2$$~~
$$v = \sqrt{\frac{mg}{c}}$$

b.

9.

$$a. \quad at = 33.3 \quad \frac{1}{2}at^2 = 180 \quad t = 10.8$$

$$33.3t = 360 \quad a = 3.08 \quad A = 3.08 \text{ m/s}^2$$

b.

$$3.08 \times 1400 = 4312 \quad A = 4312 \text{ N}$$

c.

$$f = mg\mu \quad \frac{4312}{1400 \times 9.8} = \mu = 0.314 \quad A = 0.314$$

10.

$$f = Mg \cos \theta \mu$$

$$kx = Mg \sin \theta \pm Mg \cos \theta \mu$$

$$x = \frac{Mg(\sin \theta \pm \mu \cos \theta)}{k}$$

$$a. \quad \frac{Mg(\sin \theta + \mu \cos \theta)}{k}$$

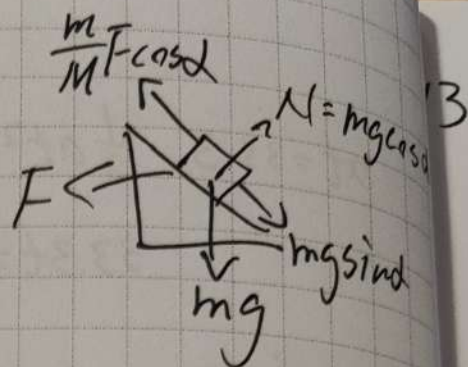
A:

$$b. \quad \frac{Mg(\sin \theta - \mu \cos \theta)}{k}$$

11.

$$a. \quad \frac{m}{M} F \cos \alpha = mg \sin \alpha$$

$$F = Mg \tan \alpha$$



b.

$$\frac{m}{M} F \cos \theta \pm mg \mu \cos \alpha = mg \sin \alpha$$

$$\frac{m}{M} F \pm mg \mu = mg \tan \alpha$$

$$F = Mg (\tan \alpha \mp \mu)$$

$$Mg (\tan \alpha - \mu) \leq F \leq Mg (\tan \alpha + \mu)$$

12

$$at = 50 \quad \frac{1}{2} at^2 = 80 \quad t = 3.2 \quad a = 15.625$$

$$F - mg = ma$$

$$F = 508.5$$

$$A: 508.5 \text{ N}$$

13

14

$$\frac{1}{2}m(36-4) = \frac{1}{2}m \times 32 = 16m$$

$$40\% = 16 \times 0.42$$

$$x = 0.168$$

$$A: 0.168m$$

15.

$$18 - 0.53 \times 14 = 10.58 \quad (18 + 10.58) \times 14 \times \frac{1}{2} = 200.06$$

$$v = 8.17$$

$$A: 8.17 \frac{m}{s}$$

$$= 3v^2$$