Chapter 5 Even Answers

2. (a) 5.00 m / s^2 (b) 19.6 N (c) 10.0 m / s^2
4. 444 s
6. (a) 1.44 m (b) (50.9**i** + 1.40**j**) N
8. 4.45 N
10. (a) -4.47×10^{15} m / s^2 (b) $+2.09 \times 10^{-10}$ N
12. (a) 534 N (b) 54.5 kg
14. 2.55 N for a 88.7 kg person
16. (16.3**i** + 14.6**j**) N
18. 5.15 m / s^2 at 14.0° S of E
20. (a) 181° counterclockwise from x-axis (b) 11.2 kg
(c) 37.5 m / s (d) (–37.5**i** – 0.893**j**) m / s
22. 112 N
24. T_1 = 296 N, T_2 = 163 N, T_3 = 325 N
26. (a) $T = F_g / \sin\theta$ (b) 1.79 N
28. (a) 5.10×10^3 N (b) 3.62×10^3 kg
30. (a) $a = g \tan\theta$ (b) 4.16 m / s^2
32. (a) 2.54 m / s^2 down the incline (b) 3.18 m / s
34. (a) 3.57 m / s^2 (b) 26.7 N (c) 7.14 m / s
36. (a) 36.8 N (b) 2.45 m / s^2 (c) 1.23 m
38. (a) $a_1 = 2a_2$ (b) $T_1 = \dfrac{m_1 m_2}{2m_1 + \frac{1}{2}m_2}\, g$, $T_2 = \dfrac{m_1 m_2}{m_1 + \frac{1}{4}m_2}\, g$ (c) $a_1 = \dfrac{m_2 g}{2m_1 + \frac{1}{2}m_2}$, $a_2 = \dfrac{m_2 g}{4m_1 + m_2}$
40. 7.84 m / s^2 independent of the mass
42. 0.456
44. (a) 55.2° (b) 167 N
46. μ_s = 0.727, μ_k = 0.577
48. 221 m
50. (a) 2.31 m / s^2, down for 4.00 kg, left for 1.00 kg, up for 2.00 kg
(b) T_{left} = 30.0 N, T_{right} = 24.2 N
52. (a) 0.931 m / s^2 (b) 6.10 cm
54. (a) 3.00 s (b) 20.1 m (c) (18.0**i** – 9.00**j**) m
56. (a) 2.00 m / s^2 (b) 4.00 N on m_1, 6.00 on m_2, 8.00 on m_3
(c) 14.0 N between m_1 and m_2, 8.00 N between m_2 and m_3
58. (a) $M = 3m \sin\theta$ (b) $T_1 = 2\,mg \sin\theta$, $T_2 = 3\,mg \sin\theta$ (c) $a = \dfrac{g \sin\theta}{1 + 2\sin\theta}$
(d) $T_1 = 4mg\left(\dfrac{1 + \sin\theta}{1 + 2\sin\theta}\right)$, $T_2 = 6mg\left(\dfrac{1 + \sin\theta}{1 + 2\sin\theta}\right)$ (e) $M_{\max} = 3m(\sin\theta + \mu_s \cos\theta)$
(f) $M_{\min} = 3m(\sin\theta - \mu_s \cos\theta)$ (g) $T_{2,\max} - T_{2,\min} = (M_{\max} - M_{\min})g = 6\mu_s\, mg \cos\theta$
60. (a) (–45.0**i** + 15.0**j**) m / s (b) 162° from +x-axis (c) (–225**i** + 75.0**j**) m (d) (–227, 79.0) m
62. (a) 4.90 m / s^2 (b) 3.13 m / s (c) 1.35 m (d) 1.14 s (e) no
64. The system does not start to move when released, $f_1 + f_2$ = 29.4 N
66. a = 0.143 m / s^2, approximately 4% high
68. (b) T = 9.80 N, a = 0.580 m / s^2

70. (a) $m_2 g\left[\dfrac{m_1 M}{m_1 M + m_2(m_1 + M)}\right]$ (b) $\dfrac{m_2 g(M + m_1)}{m_1 M + m_2(m_1 + M)}$

(c) $\dfrac{m_1 m_2 g}{m_1 M + m_2(m_1 + M)}$ (d) $\dfrac{M m_2 g}{m_1 M + m_2(m_1 + M)}$

72. (a) 2.20 m / s^2 (b) 27.4 N

74. (a) 600 N (b) 1100 N (forward)

76. (a) $T_1 = \dfrac{2mg}{\sin\theta_1}$, $T_2 = \dfrac{mg}{\sin\theta_2} = \dfrac{mg}{\sin\left[\tan^{-1}\left(\frac{1}{2}\tan\theta_1\right)\right]}$ (b) $\theta_2 = \tan^{-1}\left(\dfrac{\tan\theta_1}{2}\right)$

78. n = (82.3 N) cos θ, a = (9.80 m / s^2) sin θ