Chapter 4 Even Answers

2. (a) $(1.00\mathbf{i} + 0.750\mathbf{j})$ m/s   (b) $(1.00\mathbf{i} + 0.500\mathbf{j})$ m/s, 1.12 m/s

4. (a) $(-5.00\omega\mathbf{i} + 0\mathbf{j})$ m/s, $(0\mathbf{i} + 5.00\omega^2\mathbf{j})$ m/s^2
   (b) $\mathbf{r} = (4.00\ \text{m})\mathbf{i} + (5.00\ \text{m})(-\mathbf{i}\sin\omega t - \mathbf{j}\cos\omega t)$,
       $\mathbf{v} = (5.00\ \text{m})\omega(-\mathbf{i}\cos\omega t + \mathbf{j}\sin\omega t)$,
       $\mathbf{a} = (5.00\ \text{m})\omega^2\ (\mathbf{i}\sin\omega t + \mathbf{j}\cos\omega t)$
   (c) path is a circle of 5.00 m radius and centered at (0, 4.00) m

6. (a) $-12.0t\,\mathbf{j}$ m/s, $-12.0\,\mathbf{j}$ m/s^2 (b) $(3.00\mathbf{i} - 6.00\mathbf{j})$ m, $-12.0\mathbf{j}$ m/s

8. (a) $\mathbf{r} = [5.00t\mathbf{i} + \frac{1}{2}(3.00t^2)\,\mathbf{j}]$ m, $\mathbf{v} = [5.00\mathbf{i} + (3.00t)\mathbf{j}]$ m/s

   (b) (10.0 m, 6.00 m), 7.81 m/s

10. (a) $v = d\sqrt{\dfrac{g}{2h}}$ horizontally   (b) $\theta = \tan^{-1}\left(\dfrac{2h}{d}\right)$ below the horizontal

12. 48.6 m/s

14. 0.600 m/s^2

16. (a) 22.6 m (b) 52.3 m (c) 1.18 s

18. $x_h = \dfrac{v_i^2\sin\theta_i\cos\theta_i}{g}$, $R = \dfrac{v_i^2\sin 2\theta_i}{g}$

20. 18.7 m

22. 9.91 m/s

24. (a) 1.02×10^3 m/s   (b) 2.72×10^{-3} m/s^2

26. 0.0337 m/s^2 directed toward center of the Earth

28. 0.186 s^{-1}

30. 7.58×10^3 m/s, 5.80×10^3 s (96.7 min)

32. (a) 0.600 m/s^2 (b) 0.800 m/s^2 (c) 1.00 m/s^2 (d) 53.1° inward from path

34. (a) 30.8 m/s^2 down (b) 70.4 m/s^2 upward

36. (a) 26.9 m/s (b) 67.3 m (c) $(2.00\mathbf{i} - 5.00\mathbf{j})$ m/s^2

38. 18.0 s

40. $t_{\text{Alan}} = \dfrac{2L/c}{1 - v^2/c^2}$, $t_{\text{Beth}} = \dfrac{2L/c}{\sqrt{1 - v^2/c^2}}$, Beth returns first.

42. (a) 10.1 m/s^2 at 14.3° south of vertical
    (b) 9.80 m/s^2 vertically downward

44. (a) $2\sqrt{\dfrac{R}{3g}}$ (b) $\dfrac{1}{2}\sqrt{3gR}$ (c) $\sqrt{gR/3}$ (d) $\sqrt{\dfrac{13gR}{12}}$ (e) 33.7° (f) $\dfrac{13R}{24}$ (g) $\dfrac{13R}{12}$

46. 54.4 m/s^2

48. (b) $A = -\dfrac{g}{2v_i^2}$ (c) 14.5 m/s

50. (a) 1.69 km/s   (b) 1.80 h

52. 10.7 m/s

54. (a) 26.6°   (b) 0.949

56. $\dfrac{R}{2}$

58. 7.50 m/s in direction ball was thrown

60. (a) $v_i > \sqrt{gR}$ (b) $(\sqrt{2} - 1)\,R$

62. (18.8, −17.3) m

64.   0.139 m/s
66.   (a) 22.9 m/s   (b) 360 m from base of cliff   (c) $(114\mathbf{i} - 44.3\mathbf{j})$m/s
68.   (a) 5.14 s   (b) $(-1.30\mathbf{i} + 4.68\mathbf{j})$ m/s where $+\mathbf{i}$ is eastward and $+\mathbf{j}$ is northward
        (c) 19.4 m
70.   Safe distances are less than 270 m or greater than 3.48×10^3 m from the eastern shore.