Section 2.6 (page 154)

1. (a) $\frac{3}{4}$ (b) 20 **3.** (a) $-\frac{5}{8}$ (b) $\frac{3}{2}$

5. (a) -8 cm/sec (b) 0 cm/sec (c) 8 cm/sec

7. (a) 8 cm/sec (b) 4 cm/sec (c) 2 cm/sec

9. In a linear function, if x changes at a constant rate, so does y. However, unless $a = 1$, y does not change at the same rate as x.

11. $(4x^3 + 6x)/\sqrt{x^4 + 3x^2 + 1}$

13. (a) 64π cm^2/min (b) 256π cm^2/min

15. (a) Proof

(b) When $\theta = \frac{\pi}{6}, \frac{dA}{dt} = \frac{\sqrt{3}}{8}s^2$. When $\theta = \frac{\pi}{3}, \frac{dA}{dt} = \frac{1}{8}s^2$.

(c) If s and $d\theta/dt$ are constant, dA/dt is proportional to $\cos\theta$.

17. (a) $2/(9\pi)$ cm/min (b) $1/(18\pi)$ cm/min

19. (a) 144 cm^2/sec (b) 720 cm^2/sec **21.** $8/(405\pi)$ ft/min

23. (a) 12.5% (b) $\frac{1}{144}$ m/min

25. (a) $-\frac{7}{12}$ ft/sec; $-\frac{3}{2}$ ft/sec; $-\frac{48}{7}$ ft/sec

(b) $\frac{527}{24}$ ft^2/sec (c) $\frac{1}{12}$ rad/sec

27. Rate of vertical change: $\frac{1}{5}$ m/sec

Rate of horizontal change: $-\sqrt{3}/15$ m/sec

29. (a) -750 mi/h (b) 30 min

31. $-50/\sqrt{85} \approx -5.42$ ft/sec **33.** (a) $\frac{25}{3}$ ft/sec (b) $\frac{10}{3}$ ft/sec

35. (a) 12 sec (b) $\frac{1}{2}\sqrt{3}$ m (c) $\left(\sqrt{5}\pi\right)/120$ m/sec

37. Evaporation rate proportional to $S \Longrightarrow \dfrac{dV}{dt} = k(4\pi r^2)$

$V = \left(\dfrac{4}{3}\right)\pi r^3 \Longrightarrow \dfrac{dV}{dt} = 4\pi r^2 \dfrac{dr}{dt}$. So $k = \dfrac{dr}{dt}$.

39. 0.6 ohm/sec **41.** $\dfrac{dv}{dt} = \dfrac{16r}{v}\sec^2\theta\dfrac{d\theta}{dt}$, $\dfrac{d\theta}{dt} = \dfrac{v}{16r}\cos^2\theta\dfrac{dv}{dt}$

43. $\dfrac{2\sqrt{21}}{525} \approx 0.017$ rad/sec

45. (a) $\dfrac{200\pi}{3}$ ft/sec (b) 200π ft/sec (c) About 427.43π ft/sec

47. About 84.9797 mi/h

49. (a) $\dfrac{dy}{dt} = 3\dfrac{dx}{dt}$ means that y changes three times as fast as x changes.

(b) y changes slowly when $x \approx 0$ or $x \approx L$. y changes more rapidly when x is near the middle of the interval.

51. -18.432 ft/sec^2 **53.** About -97.96 m/sec