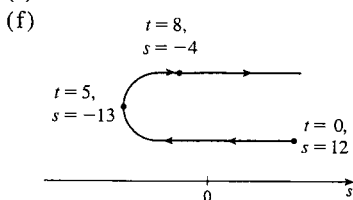
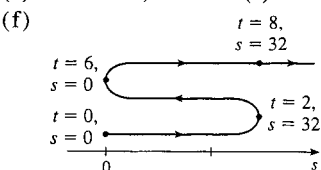


Exercises 3.4 □ page 166

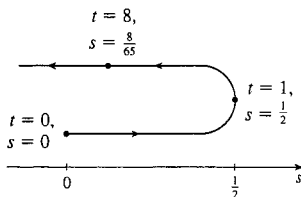
1. (a) $2t - 10$ (b) -4 ft/s (c) $t = 5$ (d) $t > 5$
 (e) 34 ft



3. (a) $3t^2 - 24t + 36$ (b) -9 ft/s (c) $t = 2, 6$
 (d) $0 \leq t < 2, t > 6$ (e) 96 ft



5. (a) $(1 - t^2)/(t^2 + 1)^2$ (b) $-\frac{2}{25}$ ft/s (c) $t = 1$
 (d) $0 \leq t < 1$ (e) $\frac{57}{65}$ ft (f)



7. $t = 4$ s 9. (a) 5.02 m/s (b) $\sqrt{17}$ m/s

11. (a) 30 mm²/mm; the rate at which the area is increasing with respect to side length as x reaches 15 mm

(b) $\Delta A \approx 2x \Delta x$

13. (a) (i) 5π (ii) 4.5π (iii) 4.1π

(b) 4π (c) $\Delta A \approx 2\pi r \Delta r$

15. (a) 8π ft²/ft (b) 16π ft²/ft (c) 24π ft²/ft

The rate increases as the radius increases.

17. (a) 6 kg/m (b) 12 kg/m (c) 18 kg/m

At the right end; at the left end

19. (a) 4.75 A (b) 5 A; $t = \frac{2}{3}$ s

21. (a) $dV/dP = -C/P^2$ (b) At the beginning

23. (a) 16 million/year; 78.5 million/year

(b) $P(t) = at^3 + bt^2 + ct + d$, where $a \approx 0.00129371$,
 $b \approx -7.061422$, $c \approx 12,822.979$, $d \approx -7,743,771$

- (c) $P'(t) = 3at^2 + 2bt + c$ (d) 14.48 million/year;
 75.29 million/year (e) 81.62 million/year

25. (a) $a^2k/(akt + 1)^2$

27. (a) 0.926 cm/s; 0.694 cm/s; 0

(b) 0; -92.6 (cm/s)/cm; -185.2 (cm/s)/cm

(c) At the center; at the edge

29. (a) $C'(x) = 3 + 0.02x + 0.0006x^2$

- (b) \$11/pair, the rate at which the cost is changing as the 100th pair of jeans is being produced; the cost of the 101st pair

(c) \$11.07

31. (a) $[xp'(x) - p(x)]/x^2$; the average productivity increases as new workers are added.

33. -0.2436 K/min

35. (a) 0 and 0 (b) $C = 0$

(c) (0, 0), (500, 50); it is possible for the species to coexist.