

1.

- a) 9 m/s
- b)  $t = 2$  sec and  $t = 4$  sec
- c)  $0 \leq t < 2$  and  $t > 4$
- d) 42 m
- e) Speeding up:  $2 < t < 3, t > 4$ ; Slowing down:  $0 \leq t < 2, 3 < t < 4$

2.

- a)  $t = 1$  sec and  $t = 3$  sec
- b)  $0 \leq t < 1$  and  $t > 3$
- c) 12 m
- d)  $0 \text{ m/s}^2$
- e) Speeding up:  $1 < t < 2, t > 3$ ; Slowing down:  $0 \leq t < 1, 2 < t < 3$

3.

- a)  $t = 1$  sec and  $t = 2$  sec
- b)  $5\frac{1}{2}$  m
- c)  $-3 \text{ m/s}^2$
- d) Speeding up:  $1 < t < 1.5, t > 2$ ; Slowing down:  $0 \leq t < 1, 1.5 < t < 2$

4.  $16\pi \text{ in}^2/\text{in}$ ;  $24\pi \text{ in}^2/\text{in}$ ;  $32\pi \text{ in}^2/\text{in}$ ; The rate at which the surface area increases is increasing as the radius gets bigger.

5.  $6\pi \text{ cm}^2/\text{cm}$ ;  $8\pi \text{ cm}^2/\text{cm}$ ;  $10\pi \text{ cm}^2/\text{cm}$ ; The rate at which the area of the circle increases is increasing as the radius gets bigger.

6.  $36\pi \text{ cm}^3/\text{cm}$

7.  $2\pi \text{ ft}/\text{ft}$

8.  $\frac{1}{6} \text{ g}/\text{mm}$

9.  $\frac{2}{27} \text{ oz}/\text{in}$  (Note: "oz" stands for "ounces")

### Review

10.

- a)  $f'(x) = 3^{\sin 2x} \cdot \ln 3 \cdot \cos 2x \cdot 2$
- b)  $\frac{dy}{dx} = -\frac{2}{x^2} - x^2 e^{-x} + 2x e^{-x} + e^x \csc(e^x) \cot(e^x)$
- c)  $f'(x) = -\frac{1}{t(\ln t)^2} + 2t \operatorname{sech}^2(t^2)$