

Review Solutions:

Related Rates & Optimization

1. $\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$

2. $\frac{ds}{dt} = 8\pi r \frac{dr}{dt}$

3. $\frac{dA}{dt} = \pi \text{ cm}^2/\text{sec}$

4 a) $\frac{dA}{dt} = 14 \text{ cm}^2/\text{sec}$

b) $\frac{dP}{dt} = 0 \text{ cm}/\text{sec}$

c) $\frac{dh}{dt} = -\frac{14}{13} \text{ cm}/\text{sec}$

5. a) $\frac{dr}{dt} = 1 \text{ ft}/\text{min}$

b) $\frac{ds}{dt} = 40\pi \text{ ft}^2/\text{min}$

6. $\frac{dx}{dt} = \frac{1000\sqrt{5}}{17} \text{ mph}$

7. $\frac{ds}{dt} = 20 \text{ ft}/\text{sec}$

8. $\frac{dv}{dt} = 4\pi \frac{dr}{dt}$

9. $\frac{dy}{dt} = -\frac{3}{4} \text{ ft}/\text{sec}$

10. $P = 400 \text{ ft}$

11. $\frac{80}{3} \text{ ft} \times 40 \text{ ft}$

12. a) $A = (3-2x)(7-2x)(x)$

b) $x = .653 \text{ in } (V = 6.3 \text{ in}^3)$

13 a) min $10 \frac{1}{4} 10$
max $0 \frac{1}{4} 20$

b) min $0 \frac{1}{4} 20$
max $\frac{1}{4} \frac{1}{4} \frac{79}{4}$

14. $A = 25/4 \text{ cm}^2$

15. $P = 16 \text{ in}, 4 \text{ in} \times 4 \text{ in}$

16. $x = 2, A = 32, 4 \times 8$

17. $x = 10, y = 5 : A = 9 \text{ in} \times 18 \text{ in}$

18. $\frac{dh}{dt} = \frac{9}{10\pi} \frac{m}{hr}$

19. a) $U = 3t^2 - 12t + 9$
 $a = 6t - 12$

b) right: $(0, 1) U (3, 0)$
Left $(1, 3)$

c) $t = 0, s = 0 \text{ m}$
 $t = 1, s = 4 \text{ m}$
 $t = 3, s = 0 \text{ m}$

