(b) The sign would be negative; when the wind is blowing at 10 mph, any increase in wind speed will make it feel colder, i.e., a lower number on the Fahrenheit scale.

Section 2.6

1. Answers will vary.
3. $\frac{dy}{dx} = \frac{-4x^3}{2y+1}$
5. $\frac{dy}{dx} = \sin(x)\sec(y)$
7. $\frac{dy}{dx} = \frac{y}{x}$
9. $\frac{dy}{dx} = \frac{1}{e^y+x}$
11. $-\frac{2\sin(y)\cos(y)}{x}$
13. $\frac{1}{2y+2}$
15. $\frac{-\cos(x)(x+\cos(y))+\sin(x)+y}{\sin(y)(\sin(x)+y)+x+\cos(y)}$
17. $-\frac{2x+y}{2y+x}$
19. (a) $y = 0$
    (b) $y = -1.859(x-0.1)+0.281$
21. (a) $y = 4$
    (b) $y = 0.93(x-2)+\sqrt[4]{108}$
23. (a) $y = -\frac{1}{\sqrt{3}}(x-\frac{7}{2})+\frac{6+3\sqrt{3}}{2}$
    (b) $y = \sqrt{3}(x-\frac{4+3\sqrt{3}}{2})+\frac{3}{2}$
25. $\frac{d^2y}{dx^2} = \frac{3}{5}\frac{y^{3/5}}{x^{8/5}}+\frac{3}{5}\frac{1}{yx^{6/5}}$
27. $\frac{d^2y}{dx^2} = 0$
29. $y' = (2x)^{x^2}\left(2x\ln(2x)+x\right)$
    Tangent line: $y = (2+4\ln 2)(x-1)+2$
31. $y' = x^{\sin(x)+2}\left(\cos x\ln x+\frac{\sin x+2}{x}\right)$
    Tangent line: $y = (3\pi^2/4)(x-\pi/2)+(\pi/2)^3$
33. $y' = \frac{(x+1)(x+2)}{(x+3)(x+4)}\left(\frac{1}{x+1}+\frac{1}{x+2}-\frac{1}{x+3}-\frac{1}{x+4}\right)$
    Tangent line: $y = 11/72x+1/6$

Section 2.7

1. F
3. The point $(10,1)$ lies on the graph of $y = f^{-1}(x)$ (assuming f is invertible).
5. Compose $f(g(x))$ and $g(f(x))$ to confirm that each equals x.
7. Compose $f(g(x))$ and $g(f(x))$ to confirm that each equals x.
9. $\left(f^{-1}\right)'(20) = \frac{1}{f'(2)} = 1/5$
11. $\left(f^{-1}\right)'(\sqrt{3}/2) = \frac{1}{f'(\pi/6)} = 1$
13. $\left(f^{-1}\right)'(1/2) = \frac{1}{f'(1)} = -2$
15. $h'(t) = \frac{2}{\sqrt{1-4t^2}}$
17. $g'(x) = \frac{2}{1+4x^2}$
19. $g'(t) = \cos^{-1}(t)\cos(t) - \frac{\sin(t)}{\sqrt{1-t^2}}$
21. $h'(x) = \frac{\sin^{-1}(x)+\cos^{-1}(x)}{\sqrt{1-x^2}\cos^{-1}(x)^2}$
23. $f'(x) = -\frac{1}{\sqrt{1-x^2}}$
25. (a) $f(x) = x$, so $f'(x) = 1$
    (b) $f'(x) = \cos(\sin^{-1}x)\frac{1}{\sqrt{1-x^2}} = 1.$
27. (a) $f(x) = \sqrt{1-x^2}$, so $f'(x) = \frac{-x}{\sqrt{1-x^2}}$
    (b) $f'(x) = \cos(\cos^{-1}x)(\frac{1}{\sqrt{1-x^2}} = \frac{-x}{\sqrt{1-x^2}}$
29. $y = -4(x-\sqrt{3}/4)+\pi/6$
31. $y = -4/5(x-1)+2$

Chapter 3

Section 3.1

1. Answers will vary.
3. Answers will vary.
5. F
7. A: abs. min B: none C: abs. max D: none E: none
9. $f'(0) = 0$ $f'(2) = 0$
11. $f'(0) = 0$ $f'(3.2) = 0$ $f'(4)$ is undefined
13. $f'(0)$ is not defined
15. min: $(-0.5, 3.75)$
    max: $(2, 10)$
17. min: $(\pi/4, 3\sqrt{2}/2)$
    max: $(\pi/2, 3)$
19. min: $(\sqrt{3}, 2\sqrt{3})$
    max: $(5, 28/5)$
21. min: $(\pi, -e^{\pi})$
    max: $(\pi/4, \frac{\sqrt{2}e^{\pi/4}}{2})$
23. min: $(1, 0)$
    max: $(e, 1/e)$
25. min: $(-1, -1/e)$
    max: $(1, e)$
27. No. The function $f(x)$ is not defined at $x = 0$ and therefore not continuous on $[0, 10]$.
29. No. The interval $[1, \infty)$ is not a closed interval $[a, b]$.
31. Yes
33. $y = -4/5(x-1)+2$

Section 3.2

1. Answers will vary.
3. Any c in $[-1, 1]$ is valid.
5. $c = -1/2$
7. Rolle's Thm. does not apply.
9. Rolle's Thm. does not apply.
11. $c = 0$
13. $c = 3/\sqrt{2}$
15. The Mean Value Theorem does not apply.
17. $c = e^{5ln(5)/4-1} = \sqrt[4]{3125}/e$
19. $c = -2/3$
21. $c = \frac{\pm\sqrt{\pi^2-4}}{\pi}$
23. $c = \dfrac{4+\sqrt{31}}{3}$
25. Yes.

27. Max value of 19 at $x = -2$ and $x = 5$; min value of 6.75 at $x = 1.5$.

29. They are the odd, integer valued multiples of $\pi/2$ (such as $0, \pm\pi/2, \pm 3\pi/2, \pm 5\pi/2$, etc.)

Section 3.3

1. Answers will vary.
3. Answers will vary.
5. Increasing
7. Graph and verify.
9. Graph and verify.
11. Graph and verify.
13. Graph and verify.
15. domain=$(-\infty, \infty)$
c.p. at $c = -2, 0$;
increasing on $(-\infty, -2) \cup (0, \infty)$;
decreasing on $(-2, 0)$;
rel. min at $x = 0$;
rel. max at $x = -2$.
17. domain=$(-\infty, \infty)$
c.p. at $c = 1$;
increasing on $(-\infty, \infty)$;
no relative extrema.
19. domain=$(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$
c.p. at $c = 0$;
decreasing on $(-\infty, -1) \cup (-1, 0)$;
increasing on $(0, 1) \cup (1, \infty)$;
rel. min at $x = 0$.
21. domain=$(-\infty, 0) \cup (0, \infty)$;
c.p. at $c = 2, 6$;
decreasing on $(-\infty, 0) \cup (0, 2) \cup (6, \infty)$;
increasing on $(2, 6)$;
rel. min at $x = 2$; rel. max at $x = 6$.
23. domain=$(-\infty, \infty)$
c.p. at $c = 0$;
increasing on $(-\infty, \infty)$;
no relative extrema.
25. domain=$(0, \infty)$
c.p. at $c = \frac{1}{e}$;
increasing on $(1/e, \infty)$;
decreasing on $(0, 1/e)$;
rel. min at $x = 1/e$.
27. domain=$(-\pi, \pi)$
c.p. at $c = -3\pi/4, -\pi/4, \pi/4, 3\pi/4$;
decreasing on $(-3\pi/4, -\pi/4) \cup (\pi/4, 3\pi/4)$;
increasing on $(-\pi, -3\pi/4) \cup (-\pi/4, \pi/4) \cup (3\pi/4, \pi)$;
rel. min at $x = -\pi/4, 3\pi/4$;
rel. max at $x = -3\pi/4, \pi/4$.
29. $c = 1/2$

Section 3.4

1. Answers will vary.
3. Yes; Answers will vary.
5. T
7. Graph and verify.
9. Graph and verify.
11. Graph and verify.
13. Graph and verify.
15. Graph and verify.
17. Graph and verify.
19. Possible points of inflection: none; concave down on $(-\infty, \infty)$
21. Possible points of inflection: $x = 1/2$; concave down on $(-\infty, 1/2)$; concave up on $(1/2, \infty)$
23. Possible points of inflection: $x = (1/3)(2 \pm \sqrt{7})$; concave up on $((1/3)(2 - \sqrt{7}), (1/3)(2 + \sqrt{7}))$; concave down on $(-\infty, (1/3)(2 - \sqrt{7})) \cup ((1/3)(2 + \sqrt{7}), \infty)$
25. Possible points of inflection: $x = \pm 1/\sqrt{3}$; concave down on $(-1/\sqrt{3}, 1/\sqrt{3})$; concave up on $(-\infty, -1/\sqrt{3}) \cup (1/\sqrt{3}, \infty)$
27. Possible points of inflection: $x = -\pi/4, 3\pi/4$; concave down on $(-\pi/4, 3\pi/4)$ concave up on $(-\pi, -\pi/4) \cup (3\pi/4, \pi)$
29. Possible points of inflection: $x = 1/e^{3/2}$; concave down on $(0, 1/e^{3/2})$ concave up on $(1/e^{3/2}, \infty)$
31. Possible points of inflection: $x = 0$; concave down on $(0, \infty)$ concave up on $(-\infty, 0)$
33. Possible points of inflection: $x = \pm 1/\sqrt{2}$; concave down on $(-1/\sqrt{2}, 1/\sqrt{2})$ concave up on $(-\infty, -1/\sqrt{2}) \cup (1/\sqrt{2}, \infty)$
35. max: $x = -5/2$
37. No relative extrema
39. max: $x = -1, 2$; min: $x = 1$
41. max: $x = 0$
43. max: $x = \pi/4$; min: $x = -3\pi/4$
45. min: $x = 1/\sqrt{e}$
47. No relative extrema
49. max: $x = 0$
51. f' has no maximal or minimal value
53. f' has a minimal value at $x = 1/2$
55. f' has a relative max at: $x = (1/3)(2 + \sqrt{7})$ relative min at: $x = (1/3)(2 - \sqrt{7})$
57. f' has a relative max at $x = -1/\sqrt{3}$; relative min at $x = 1/\sqrt{3}$
59. f' has a relative min at $x = 3\pi/4$; relative max at $x = -\pi/4$
61. f' has a relative min at $x = 1/\sqrt{e^3} = e^{-3/2}$
63. f' has a relative max at $x = 0$
65. f' has a relative max at $x = -1/\sqrt{2}$; a relative min at $x = 1/\sqrt{2}$

Section 3.5

1. Answers will vary.
3. T
5. T
7. A good sketch will include the x and y intercepts..
9. Use technology to verify sketch.
11. Use technology to verify sketch.
13. Use technology to verify sketch.
15. Use technology to verify sketch.
17. Use technology to verify sketch.
19. Use technology to verify sketch.
21. Use technology to verify sketch.

23. Use technology to verify sketch.
25. Use technology to verify sketch.
27. Critical points: $x = \frac{n\pi/2 - b}{a}$, where n is an odd integer Points of inflection: $(n\pi - b)/a$, where n is an integer.
29. $\frac{dy}{dx} = -x/y$, so the function is increasing in second and fourth quadrants, decreasing in the first and third quadrants.
    $\frac{d^2y}{dx^2} = -1/y - x^2/y^3$, which is positive when $y < 0$ and is negative when $y > 0$. Hence the function is concave down in the first and second quadrants and concave up in the third and fourth quadrants.

Chapter 4

Section 4.1

1. T
3. (a) $5/(2\pi) \approx 0.796$cm/s
   (b) $1/(4\pi) \approx 0.0796$ cm/s
   (c) $1/(40\pi) \approx 0.00796$ cm/s
5. 63.14mph
7. Due to the height of the plane, the gun does not have to rotate very fast.
   (a) 0.0573 rad/s
   (b) 0.0725 rad/s
   (c) In the limit, rate goes to 0.0733 rad/s
9. (a) 0.04 ft/s
   (b) 0.458 ft/s
   (c) 3.35 ft/s
   (d) Not defined; as the distance approaches 24, the rates approaches ∞.
11. (a) 50.92 ft/min
    (b) 0.509 ft/min
    (c) 0.141 ft/min
    As the tank holds about 523.6ft^3, it will take about 52.36 minutes.
13. (a) The rope is 80ft long.
    (b) 1.71 ft/sec
    (c) 1.87 ft/sec
    (d) About 34 feet.
15. The cone is rising at a rate of 0.003ft/s.

Section 4.2

1. $0/0, \infty/\infty, 0 \cdot \infty, \infty - \infty, 0^0, 1^\infty, \infty^0$
3. F
5. derivatives; limits
7. Answers will vary.
9. $5/8$
11. 3
13. $-5/3$
15. -1
17. $-\sqrt{2}/2$
19. 0
21. a/b
23. 1
25. $1/2$
27. 4
29. 0
31. ∞
33. 0
35. 2
37. $\ln 3 - \ln 2$
39. 0
41. -2
43. 0
45. 0
47. ∞
49. ∞
51. 0
53. ∞
55. 1
57. $8/27$
59. 1
61. 0
63. 1
65. ∞
67. 2
69. $1/2$
71. 1
73. 3

Section 4.3

1. T
3. 2500; the two numbers are each 50.
5. There is no maximum sum; the fundamental equation has only 1 critical value that corresponds to a minimum.
7. Area = 1/4, with sides of length $1/\sqrt{2}$.
9. The radius should be about 3.84cm and the height should be $2r = 7.67$cm. No, this is not the size of the standard can.
11. The height and width should be 18 and the length should be 36, giving a volume of $11,664$in^3.
13. $5 - 10/\sqrt{39} \approx 3.4$ miles should be run underground, giving a minimum cost of $374,899.96.
15. The dog should run about 19 feet along the shore before starting to swim.
17. The largest area is 2 formed by a square with sides of length $\sqrt{2}$.

Section 4.4

1. T
3. F
5. Answers will vary.
7. Use $y = x^2$; $dy = 2x \cdot dx$ with $x = 6$ and $dx = -0.07$. Thus $dy = -0.84$; knowing $6^2 = 36$, we have $5.93^2 \approx 35.16$.
9. Use $y = x^3$; $dy = 3x^2 \cdot dx$ with $x = 7$ and $dx = -0.2$. Thus $dy = -29.4$; knowing $7^3 = 343$, we have $6.8^3 \approx 313.6$.
11. Use $y = \sqrt{x}$; $dy = 1/(2\sqrt{x}) \cdot dx$ with $x = 25$ and $dx = -1$. Thus $dy = -0.1$; knowing $\sqrt{25} = 5$, we have $\sqrt{24} \approx 4.9$.