1a. 6
1b. -1
1c. does not exist
1d. The function is not continuous at x = 4 since the limit as $x \to 4$ does not exist
2a. does not exist

2b. 3
2c. 3

3a. -38
3b. 18
3c. $\sqrt{13}$

4. 4x – 9; -5

5. $y = -24x + 21$

6. 0, 2, 4

7. $\dfrac{x^{-5/6}}{6} + 4x^{-2}$

8. $y' = 9x^2 - 14x + 8$

9. $y' = -\dfrac{15}{2}x^{7/2} - 2x^{3/2} + 12x^{11}$

10. $s'(t) = 9.38t$

11. $f'(x) = 45x^2 + 6x + 5$

12. $y' = 9x^2 - 14x - 4x^{-3}$

13. $y' = -72x^8 + 6x^5 - 35x^4 + 96x^3 - 3$

14. $y' = \dfrac{-40x^4 + 48x^2 + 10x}{(8x^3 + 1)^2}$

15. -0.0097

16. $\dfrac{dy}{dx} = \dfrac{x}{\sqrt{x^2 + 2}}$

17. $f'(x) = 22(10x^4 - 15x^2)(2x^5 - 5x^3 + 5)^{21}$

18. 0.3 meters per second
19a. $D(t) = \dfrac{55000}{1.6t + 12}$
19b. -2.490 units per day

20. $f''(x) = 10 - 48x^{-5}$

21a. $v(t) = 2t + 4$
21b. $a(t) = 2$
21c. $v(2) = 8$, $a(2) = 2$

22. $S'(4) = 146$, $S''(4) = 70$

23. $\left(-\dfrac{2}{3}, -\dfrac{94}{27}\right)$ relative minimum
(2, 6) relative maximum

24. There is no relative maximum and there is no relative minimum.

25. $(6, 102.2)$ relative maximum

26a. $(0, -17)$, $(4, 15)$
26b. $(2, -1)$
26c. increasing on $(0,4)$ and decreasing on $(-\infty, 0) \cup (4, \infty)$
26d. concave up on $(-\infty, 2)$ and concave down on $(2, \infty)$

27a. $(-5, 0)$
27b. there are no inflection points
27c. decreasing on $(-\infty, -5)$ and increasing on $(-5, \infty)$
27d. concave down on $(-\infty, -5) \cup (-5, \infty)$

28. absolute max is $\dfrac{17}{4}$ at $x = -\dfrac{1}{2}$
absolute min is -97 at $x = 4$

29. absolute max is 182 at $x = -5, 5$
absolute min is -74 at $x = -3, 3$

30. 950 units are produced in year 20.

31. $P(x) = -\frac{1}{2}x^2 + 200x - 4700$; profit is maximized for a production of 200 units.

32. The maximum area is 180,000 square meters. The length of the shorter side is 300 meters and the length of the longer side is 600 meters.

33. The shed is 18 ft by 18 ft for a total area of 324 feet.

34a. $R(x) = 190x - 0.5x^2$

34b. $P(x) = -1.25x^2 + 190x - 2000$

34c. 76 suits

34d. $5220.00

34e. $152.00

35. $10 per ticket; 70,000 people

36. 23 trees per acre

37a. $P(x) = -0.001x^2 + 3.8x - 60$

37b.

$R(100) = \$500, \quad C(100) = \$190, \quad P(100) = \$310$

37c.

$R'(x) = 5, C'(x) = 0.002x + 1.2, \quad P'(x) = -0.002x + 3.8$

37d.

$R'(100) = \$5, C'(100) = \$1.40, \quad P'(100) = \$3.60$

38a. $1234.38

38b. $24.52

38c. $24.38

38d. $48.75

38e. $1283.13

39. $\frac{dy}{dx} = \frac{3x^2}{y}$

at $(2,-7), \frac{dy}{dx} = -\frac{12}{7}$

40. $\frac{dy}{dx} = \frac{-6x - 8y}{8x + 6y + 19}$

at $(-1,0), \frac{dy}{dx} = \frac{6}{11}$

41a. $24 per day

41b. $8 per day

41c. $16 per day

42. -21112 square miles per year

43. $f'(x) = 5x^4 - 18e^{3x}$

44. $f'(x) = (7x + 4)x^3e^{7x}$

45. $F'(x) = \frac{2e^{2x}(x-2)}{x^5}$

46. $C'(t) = 60e^{-t}$; $C'(0) = 60$;
$C'(3) = 2{,}987{,}000$

47. $f'(x) = 4x^3 \ln 7x + x^3$

48. $f'(x) = \frac{9}{x}$

49a. $E(x) = \frac{p}{307 - p}$

49b. $E(114) = \frac{114}{193}$; since 114/193 < 1, the demand is inelastic

49c. $153.50

50a. $E(x) = \frac{7x}{262 - 7x}$

50b. 19¢

50c. Prices > 19¢

50d. Prices < 19¢

50e. Since $E(12) < 1$, a small increase in price will cause the total revenue to decrease.

51. $\frac{1}{3}x^3 - \frac{9}{2}x^2 + 2x + C$

52. $\frac{1}{5}x^5 - 3x^{3/2} - 4x^{-1/4} + C$

53. $7\ln x - \frac{2}{5}e^{5x} + \frac{2}{7}x^{7/2} + C$

54. $D(x) = 4000x^{-1} + 3$

55. $C(x) = \frac{x^5}{5} - x^2 + 4000$

56. 46800¢ or $468

57. 2700.695

58. $173\frac{1}{3}$ or $\frac{520}{3}$

59. $767\frac{1}{4}$ or $\frac{3069}{4}$

60. $3\frac{2}{3}$ or $\frac{11}{3}$

61. 961.80

62a. 75.73 meters
62b. 210.13 meters

63. 30

64. 3

65. $\frac{32}{3}$ or $10\frac{2}{3}$

66. -10

67. $630,162.08

68. $\frac{1}{8}(x^3 - 6)^8 + C$

69. $\frac{1}{5}e^{x^5} + C$

70. $\frac{1}{2}\ln(2x + 1) + C$

71a. (6, 6)
71b. 15
71c. 9

72a. $f_x = 24x^2 - 3y$
72b. $f_y = 12y - 3x$
72c. $f_x(-2,0) = 96$
72d. $f_y(-2,0) = 6$

73a. $f_x = -72e^{8x-3y}$
73b. $f_y = 27e^{8x-3y}$

74a. $f_{xx} = 160x^3y^4 + 168x^5y^8$
74b. $f_{yy} = 96x^5y^2 + 224x^7y^6$
74c. $f_{xy} = 160x^4y^3 + 224x^6y^7$
74d. $f_{yx} = 160x^4y^3 + 224x^6y^7$

75a. 139,696

75b. $p_x = 1920x^{-1/5}y^{1/5}$ and $p_y = 480x^{4/5}y^{-4/5}$

75c. $p_x(28,1087) = 3991$ and $p_y(28,1087) = 26$

75d. If capital is fixed at 1087 units, then a one-unit change in labor will cause production to increase by about 3991 units. If labor is fixed at 28 units, then a one-unit change in capital will cause production to increase by about 26 units.

76a. $f_{xx} = -\frac{13y}{x^2}$
76b. $f_{xy} = \frac{13}{x}$
76c. $f_{yx} = \frac{13}{x}$
76d. $f_{yy} = 0$

77. The relative maximum is $\frac{4000}{27}$ when $x = \frac{20}{3}$ and $y = \frac{20}{3}$. There is no relative minimum.

78. There is no relative maximum. The relative minimum is -68 when $x = 4$ and $y = -7$.

79. 3000 Type A panels, 5000 Type B panels and $157 million in profit

80. 4

81. The dimensions are 36 feet by 36 feet with a total area of 1296 square feet.

82. 1250