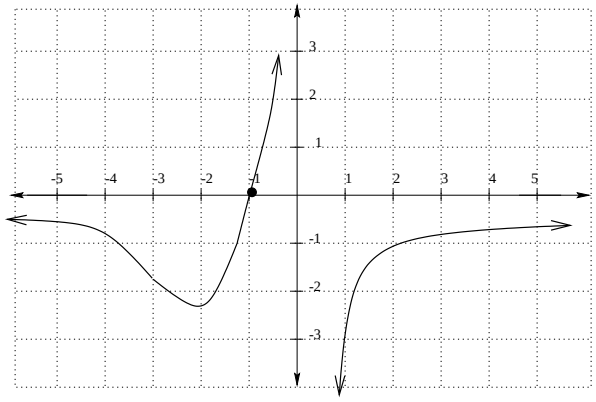
ANSWERS to Practice Problems for 142 Final Exam:

1. $x \geq 4, x \neq 2, x \neq 3$
2. (10,3)
3. $6x + 3h - 5$
4. \$1591.46
5. (a) $\frac{5}{3}$ (b) -.0223 (c) 81 (d) -2.887 (e) 12 (f) 3.419 1.0955 (h) -31.732 (i) 25 (j) -2
6. $y = -(x-4)^2 + 3$
7. 90.143 meters
8. (a) 8 (b) positive (c) even
9. 175 people/year
10. (a) \$5,918.57 (b) \$5,068.79 (c) 15.788 years
11. (a) exponential (b) 34.26 dozen (c) \$9.10
12. 2.436
13. 12.368
14.
    - $\frac{dK}{dj} = ab\left(c + \frac{1}{m}\right)^j \ln\left(c + \frac{1}{m}\right)$
    - $\frac{dK}{dm} = jab\left(c + \frac{1}{m}\right)^{j-1}(-m^{-2})$
15. \$21,758.33
16. 2.298
17. 2.165 ounces
18. graph



19. upper=28,510 lower=16,760

20. $y = -1.466x + 8.407$

21. no absolute minimum, absolute max of -2 at x=1 and x=-1

22.
- 42
- -18

23. (a) 0 (b) 1 (c) -2 (d) DNE (e) 0 (f) 0 (g) $\frac{1}{2}$

24. (a) -1 (b) 2 (c) DNE (d) 2 (e) -1 (f) DNE (g) $(-\infty, -6,) \cup (-2, 0)$ (h)+

25. $f'(x) = \pi x^{\pi-1} + 4 \cdot 2^x \ln 2 + e^{x^{\frac{1}{2}}} \left(\frac{1}{2}x^{-\frac{1}{2}}\right) - 3x^{-2}$

26. $y' = 12 - \frac{1}{e^{3x} + 3ex^4}(e^{3x}(3) + 12ex^3)$

27. $h'(x) = \frac{(5 + 2^{4x})(2x + \frac{1}{3}x^{-\frac{2}{3}} + 1) - (x^2 + \sqrt[3]{x} + x)(2^{4x} \ln 2(4))}{(5 + 2^{4x})^2}$

28. $y' = \frac{1}{3}(3 + 3x + x^{-3})^{-\frac{2}{3}}(3 - 3x^{-4})$

29. $g'(x) = 3\left(\frac{1}{e^{-x} - x}\right)(e^{-x}(-1) - 1) + 60(3x^2 + 4x)^4(6x + 4)$

30. $C'(q) = \frac{(2q^5 - 7e^{3q})^{\frac{3}{5}}(-8q^{-3} + e^{q^2+\pi}(2q)) - \left(\frac{4}{q^2} + e^{q^2+\pi}\right)\left(\frac{3}{5}(2q^5 - 7e^{3q})^{-\frac{2}{5}}\right)(10q^4 - 7e^{3q}(3))}{\left((2q^5 - 7e^{3q})^{\frac{3}{5}}\right)^2}$

31. (a) $y = \frac{59.968}{1 + 27.636e^{-.025x}}$ (b) 59,968,000 people (c) during 1858

32. \$3,396.23

33. $7a^3 - 7a$

34. 2.003

35. elastic

36. inc: $(-\infty, -4) \cup (-2, \infty)$, dec: $(-4, -2)$, concave up: $(-3, \infty)$, concave down: $(-\infty, -3)$

37. inc: $(-\infty, -3) \cup (-1, \infty)$, dec: $(-3, -1)$, concave up: $(-2, \infty)$, concave down: $(-\infty, -2)$

38. inc: $(2, \infty)$, dec: $(-\infty, 0) \cup (0, 2)$, concave up: $(-\infty, 0) \cup (\frac{4}{3}, \infty)$, concave down: $(0, \frac{4}{3})$

39. $f(10) = 45$

40. 11.36

41. 179.246

42. (500,35)

43. 2500

44. abs max of 22 at x=-1, abs min of -77 at x=2

45. $R(x) = \frac{1}{12}(6x^2+4)^3 - \frac{16}{3}$

46. 12 x 18

47. (a) $-\frac{1}{2}e^{x^2-4x} + C$ (b) $-3x^{-1} + 3x^{-2} + 4x^{\frac{1}{2}} + C$

48. \$79.44

49. $-2x - 4$, domain: $x \neq -2$

50. (a) $C(x) = 16x + 320$, $R(x) = 30x - .025x^2$ (b) 280 buckets (c) \$23/bucket

51. 36.62 years

52. $\sqrt{21}$

53. 12

54. 10

55. 16

56. (a) $\frac{6}{5}x^{\frac{5}{2}} - \frac{10}{3}x^{\frac{3}{2}} + C$ (b) $\frac{1}{12}\ln|\ln(x^4)| + C$ (c) $\frac{1}{9}\sqrt{6x^3-72x+10} + C$

57.
- $f_x = 6x^2y - 4x^3e^{x^4-y} + 5y^2$
- $f_y = 2x^3 + e^{x^4-y} + 10xy$
- $f_{xx} = 12xy - 12x^2e^{x^4-y} + 16x^6e^{x^4-y}$
- $f_{yy} = -e^{x^4-y} + 10x$
- $f_{xy} = 6x^2 + 4x^3e^{x^4-y} + 10y$
- $f_{yx} = 6x^2 + 4x^3e^{x^4-y} + 10y$

58. saddle point at (0,2)

59. maximum at (-1,-2)

60. minimum at $\left(-\frac{1}{4}, -\frac{1}{4}\right)$

61. saddle point at (-1,1) and minimum at (2,1)

62. minimum at (5,-2)

63. 88 racing bikes and 118 mountain bikes