Answers to Even Numbered Problems from textbook

Homework 1(a) & 1(b):
Page 305

22) binomial, degree 5

42) $q^3 + 8q^2 - 4q$

48) -1

56) $2x^5 - x^4 - 2x^3 + 1$

62) $t^3 - 4t^2 - t$

70) $-7z^2 + 7z - 3$

72) $-m^3 + 8m^2 - 8m$

Page R-5

4) $9r^2 - 4r + 19$

6) $0.8r^2 + 3.6r - 1.5$

Homework 2(a) & 2(b)
Pages 210 & 423 (algebra part of book), Pages 23 and 53 (calculus part of book)
P. 210

14) not a function, $Domain: \{1, 2, 3, 5\}$ $Range: \{10, 15, 19, 27\}$

16) function, $Domain: \{-2, 0, 2, 4\}$, $Range: \{-3\}$

24) function, $Domain: (-\infty, \infty)$

26) not a function, $Domain: [0, \infty)$

28) function, $Domain: (-\infty, \infty)$

32) function, $Domain: [0, \infty)$

34) function, $Domain: (-\infty, 0) \cup (0, \infty)$

36) function, $Domain: \left(-\infty, \dfrac{9}{2}\right]$

38) function, $Domain: (-\infty, -2) \cup (-2, \infty)$

46) $f\left(\dfrac{7}{3}\right) = -3$

50) $g(k) = -k^2 + 4k + 1$

52) $g(-x) = -x^2 - 4x + 1$

54) $f(x - 2) = -3x + 10$

58) $f(x + h) - f(x) = -3h$

60) $f(10) - g(10) = 113$

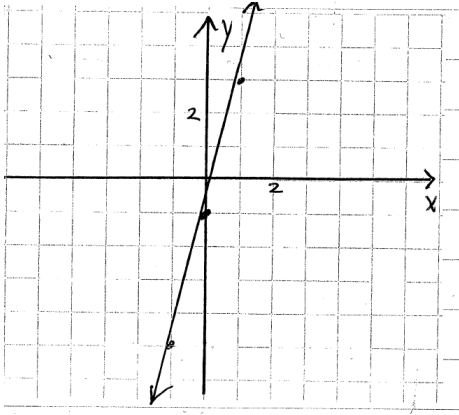62) (a) $f(2) = 5$, (b) $f(-1) = 11$

64) (a) $f(2) = 1$, (b) $f(-1) = 7$
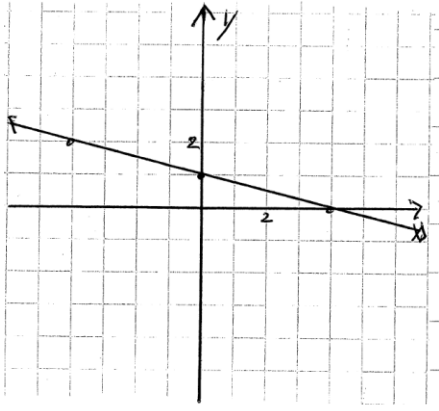
66) (a) $f(2) = -3$, (b) $f(-1) = 2$

68) (a) $y = \dfrac{1}{4}x - 2$ (b) $f(3) = -\dfrac{5}{4}$

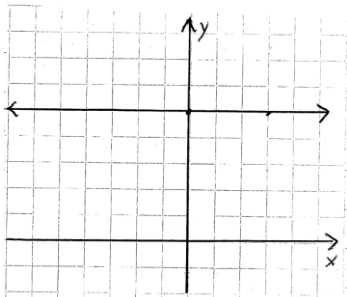72) (a) $y = \dfrac{2}{5}x + \dfrac{9}{5}$, (b) $f(3) = 3$

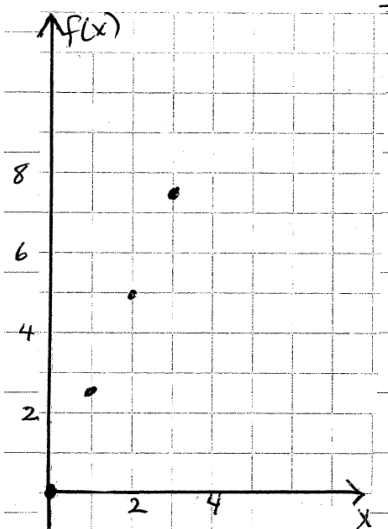76) Line has a slope of 4 and y-intercept at (0, -1). $Domain: (-\infty, \infty)$, $Range: (-\infty, \infty)$ (graph next page)

78) Line has a slope of – ¼ and a y-intercept at (0, 1). $Domain: (-\infty, \infty)$, $Range: (-\infty, \infty)$

82) Graph is a horizontal line 5 units up from the x-axis. $Domain: (-\infty, \infty)$, $Range: \{5\}$

86) (b) $f(x) = 2.5x$ Graph contains the points $(0,0)$, $(1, 2.5)$, $(2, 5)$, and $(3, 7.5)$

2

90) (a) It is a function because the graph passes the vertical line test.
    (b) Domain $D = [0, 24]$
    (c) 8 AM estimate 1100 megawatts
    (d) most electricity used at 17 hours
         Least electricity used at 4 hours
    (e) $f(12) = 1900$ (At noon, there were 1900 megawatts used.)

P. 423
6) (a) ± 5 are rejected from the Domain
   (b) Domain $D = (-\infty, -5) \cup (-5, 5) \cup (5, \infty)$

10) (a) $0, \frac{5}{3}, and -\frac{13}{4}$, are rejected from the Domain

    (b) Domain $D = (-\infty, -\frac{13}{4}) \cup (-\frac{13}{4}, 0) \cup (0, \frac{5}{3}) \cup (\frac{5}{3}, \infty)$

P. 23
6) $g(2.5) = 2$

10) $g(k^2) = 2k^2 - 3$

27 (b) $D(4) = \$11$ per watch   (e) 480 watches

33)
    (a) $C(x) = 3.5x + 90$
    (b) 17 T-shirts
    (c) 108 T-shirts

35)
    (a) $C(x) = 0.097x + 1.32$
    (b) Fixed cost is $1.32
    (c) $C(1000) = \$98.32$
    (d) $C(1001) = \$98.42$
    (e) $C'(x) = 0.097, \ C'(1001) = 0.097$ or 9.7 cents/cup
    (f) Marginal cost is 9.7 cents/cup for any number of cups.
    To produce each additional cup of coffee is 9.7 cents.

38) (a) Break-even quantity is 3 units of medals.
    (b) Profit from sell is 250 units is $3211.
    (c) A profit of $130 is made when 13 units of medals are produced and sold.

40) $x = 41$ units   Since $P(41) = -55$ dollars, it is questionable wether production should begin.

P. 53
2)   The mapping does represent a function of x.
4)   The table does not represent a function of x.
6)   The equation does represent a function of x.
8)   The equation does not represent a function of x.

18)   Domain: $D = (-\infty, \infty)$ 22)   Domain: $D = (-\infty, \infty)$

24)   Domain: $D = \left[-\frac{5}{3}, \infty\right)$ 26)   Domain: $D = (-\infty, -6) \cup (-6, 6) \cup (6, \infty)$

34) $D = [-5, \infty)$ $R = [0, \infty)$

38)
        $D = [-2, 4]$ $R = [0, 5]$
        (a) $f(-2) = 5$ (b) $f(0) = 0$ (c) $f(\frac{1}{2}) = 1$ (d) $x = \frac{1}{2}$, $x = -\frac{1}{5}$

40)
        $D = [-2, 4]$ $R = \{3\}$
        (a) $f(-2) = 3$ (b) $f(0) = 3$ (c) $f(\frac{1}{2}) = 3$ (d) no x values

50) $g\left(-\frac{5}{z}\right) = \frac{25}{z^2} - \frac{10}{z} + 5$ 58)   The graph is a function.

62)   The graph is not a function.

76(a)   approximately 66 calories/day, approximately 222 calories/day

Homework 3(a)
p. 324 (algebra part of text), p. R-5 (calculus part of text)
10) $-30y^2 - 5y$ 12) $-12a^4 + 3a^5$

40) $6m^2 + 7mn - 5n^2$ 98)   Area $= x^4 + 16x^2 + 64$

100)   Area $= x^3 + \frac{7}{2}x^2 + 7x + 6$

Homework 4
p. 61
40) $k = -6$

Homework 5
p. 92
26) $1\frac{5}{9}$ miles   28)   55 miles per hour

Homework 6
p. 567
14) $x = \frac{1}{4} + \frac{1}{4}\sqrt{5}, \frac{1}{4} - \frac{1}{4}\sqrt{5}$

24) $x = \dfrac{7}{4} + \dfrac{\sqrt{191}}{4}i, \ \dfrac{7}{4} - \dfrac{\sqrt{191}}{4}i$
34) $a = 1$

Homework 8
p. 170

38) The line with the negative slope matches line C.
40) The line with undefined slope matches line D.

p. 186

8) D 10) F 12) G 14) E

p. 13

16) $y = -x + 6$
18) $x = -8$

20) $y = -x + 7$
24) $y = 3$

26) $y = 2x + 4$
64) (a) $y = 0.053x - 0.043$
(b) about 10.2 years

68) (a) $y = -1.389t + 215.01$
(b) year 2019

70) (a) Median age for men: $M = 0.096t + 24.7$
(b) Median age for women: $M = 0.132t + 22.0$
(c) The women appear to have the faster increase in median age at first marriage, because the slope is greater than the slope for the men.
(d) year 2035
(e) 29.3 years

72) (a) Average global temperature in C degrees for t years since 1970: $T = 0.03t + 15$
(b) year 2103

74) (a) $y =$ number of radio stations carrying news/talk radio, $t =$ number of years since 2000
$y = 38.5t + 1100.5$
(b) prediction: 1408.5 The actual number is much higher than the prediction, meaning the model of the linear function may no longer be valid.

Homework 9
p. 135

10) *i* (a) 1 (b) 0
ii (a) 1 (b) 0
iii $\lim\limits_{x \to a} f(x) = 1$
iv $f(1) = 2, \ f(2) = 0$

Homework 10
p. 135

32) -4

34) $\dfrac{6}{5}$

36) 7

38) $\dfrac{1}{4}$

54) -1

56) (a) limit does not exist, (b) 7

Homework 11
p. 158

12) instantaneous velocity when $t = 3$ is 28.

26) (a) 5.998 thousand dollars or $5998
     (b) 6 thousand dollars or $6000
     (c) 5.998 thousand dollars or $5998
     (d) The additional revenue in part c is very close to the marginal revenue in part b.

42) (b) average velocity from 2 to 4 seconds is 2 ft/sec
     (c) average velocity from 4 to 6 seconds is 3 ft/sec

Homework 12
p. 176

36) There is no derivative when $x = -6$.

56 (a,b) Limit of function as $x \to 0$ is $72 - 3t$.   (a) 57 grams/minute   (b) 0 grams/minute

Homework 13
p. 207

4) $y' = 20x^3 + 27x^2 + 24x - 7$

8) $\dfrac{dy}{dx} = -\dfrac{50}{\sqrt{x}} - \dfrac{22}{3x^{1/3}}$

10) $\dfrac{dy}{dx} = -25x^{-6} + 12x^{-3} - 13x^{-2}$

12) $\dfrac{df}{dt} = -\dfrac{14}{t^2} - \dfrac{48}{t^5}$

16) $h'(x) = -\dfrac{1}{2}x^{-3/2} + 21x^{-5/2}$

20) $g'(x) = \dfrac{5}{2}x^{3/5} - \dfrac{2}{x^{1/2}}$ or $\dfrac{5}{2}x^{3/5} - \dfrac{2}{\sqrt{x}}$

24 (a) Quadratic

28) $\dfrac{-9}{2x^{3/2}} - \dfrac{3}{x^{5/2}}$

Homework 14
p. 207

32) slope $m = -31$, equation of tangent line: $y = -31x + 24$

52) (a) $30   (b) $4.80   (c) -10 dollars

56)   (a)   Marginal cost function: $C'(x) = 2$

        (b)   Marginal revenue function: $R'(x) = 6 - \frac{1}{500}x$

        (c)   Marginal profit function: $P'(x) = 4 - \frac{1}{500}x$

        (d) $x = 2000$
        (e) $4000

60)   (a)   450   (b)   325
        (a) -4 points per unit   (b) -10 points per unit

Homework 15
p. 216
34) $y = 11x - 6$

50)   (a) $N'(t) = 9t^2 - 120t + 300$ (b) -86 million bacteria per hour
        (c)   69 million bacteria per hour
        (d)   In part (b), the population is decreasing. In part (c), the population is increasing.

Homework 16
p. 216
40) $x \approx 4.828, \quad x \approx -0.828$

Homework 19
p. 86
40)   (a) $r \approx 31.04\%$ (b) $r \approx 8.19\%$

42)   (a) $26,413.52   (b) $32,913.27   (c) $43,331.33

48)   (a)   4000 bacteria   (b)   500 bacteria

Homework 20
p. 232
42)   1934   (choice b)

58)   (a)   decreasing about 44.85 grams/year   (b)   decreasing about 24.13 g/yr.
        (c)   decreasing about 6.98 g/yr

Homework 21
p. 981
90)   (b) $I \approx 69.78$ or 70   (d) $I \approx 119.518$ or 120

92)   (a)   6.0   (b)   8.0

Homework 22
p. 240
56)   (a) $R'(x) = \dfrac{60}{2x+1}$ (b) $P(x) = 30\ln(2x+1) - \frac{1}{2}x$
        (c) $P'(60) \approx 0$

(d)   When 60 items have been manufactured and sold, there is no profit to be made from selling any additional items.

64)   (a)   approximately 3 matings
        (c)   When $t = 15$ degrees, there is an increase of about 0.22 matings/degree Celsius

Homework 23
p. 260
52)   Number of infected people will begin to decline after day 9.

Homework 24
p. 271
No even numbered problems from the textbook assigned.

Homework 25
p. 283
No even numbered problems from the textbook assigned.

Homework 26
p. 785 (algebra part of book), p. 137 (calculus part of book)

44) $\lim\limits_{x \to -\infty} \dfrac{8x+2}{5x-5} = 2$

46) $\lim\limits_{x \to \infty} \dfrac{x^2+2x-5}{3x^2+2} = \dfrac{1}{3}$

48) $\lim\limits_{x \to \infty} \dfrac{2x^2-1}{3x^4+2} = 0$
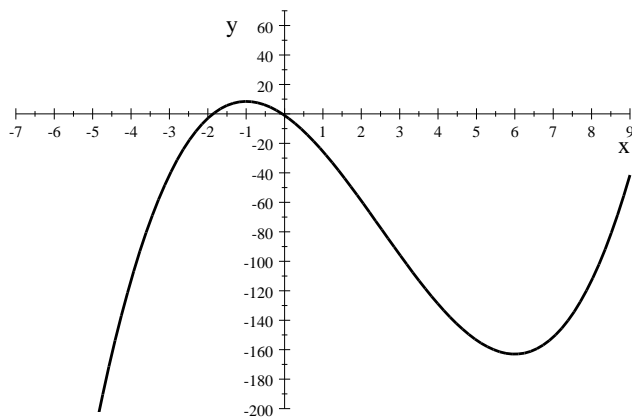
50) $\lim\limits_{x \to \infty} \dfrac{x^4-x^2-3x}{7x^2+9} = \infty$ or limit does not exist

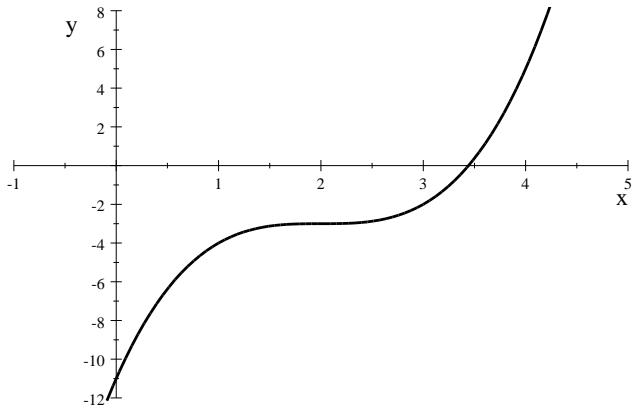52) $\lim\limits_{x \to \infty} \dfrac{-5x^3-4x^2+8}{6x^2+3x+2} = -\infty$ or limit does not exist
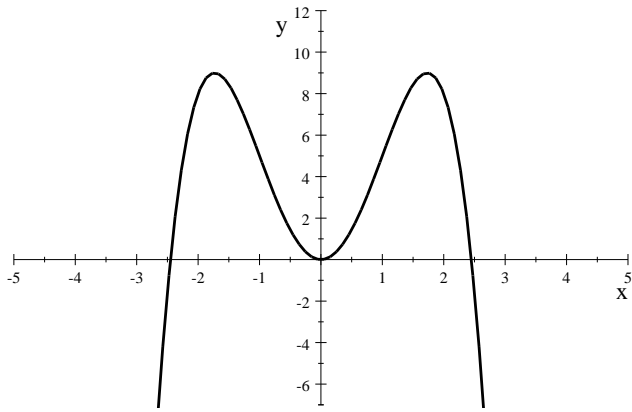
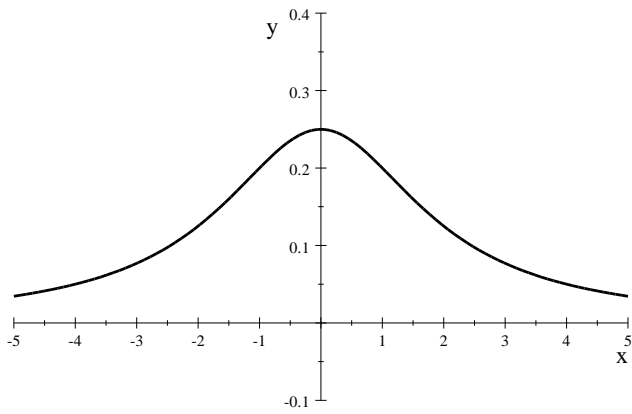## Homework 27
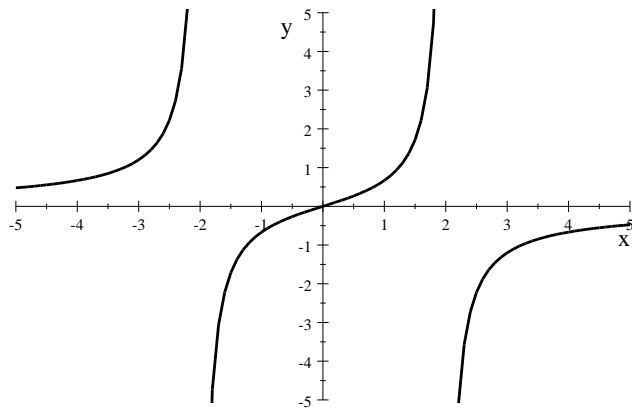### p. 294
4)

6)

8)

Homework 28
p. 294
18)

20)

Homework 29
p. 310
44)   Maximum profit is \$20,000 when 100 units per week are made.

52)   A water temperature of $12°C$ produces the maximum number of salmon swimming upstream to spawn.

Homework 30
p. 318