Chapter 1, Section 1

4. $f(x)=\frac{x}{x^2+1}$. $f(2)=\frac{2}{2^2+1}=\frac{2}{5}$. $f(0)=\frac{0}{0^2+1}=0$. $f(-1)=\frac{-1}{(-1)^2+1}=\frac{-1}{2}$

6. $g(u)=(u+1)^{3/2}$. $g(0)=(0+1)^{3/2}=1$. $g(-1)=(-1+1)^{3/2}=0$. $g(8)=9^{3/2}=27$

8. $g(x)=4+|x|$. $g(-2)=4+2=6$. $g(0)=4+0=4$. $g(2)=4+2=6$

10. $h(x)=\begin{cases}-2x+4 & x\leq 1\\ x^2+1 & x>1\end{cases}$ $h(3)=3^2+1=10$ $h(0)=-2(0)+4=4$ $h(1)=-2(1)+4=2$ $h(-3)=-2(-3)+4=10$

14. $f(t)=\frac{t+1}{t^2-t-2}$. Domain is all real numbers t so that denom $\neq 0$.

$t^2-t-2\neq 0$.

$(t-2)(t+1)\neq 0$.

Domain is All real t _except_ $t=2$, $t=-1$.

16. $f(x)=\sqrt{2x-6}$ Domain is all real x so that inside $\sqrt{\ }$ is ≥ 0.

$2x-6\geq 0$

$2x\geq 6$

$x\geq 3$. Domain is all $x\geq 3$.

24. $f(u)=(2u+10)^2$, $g(x)=x-5$.

$$
\begin{aligned}
f(g(x)) &= f(x-5)\\
&= (2(x-5)+10)^2\\
&= (2x-10+10)^2\\
&= (2x)^2\\
&= 4x^2
\end{aligned}
$$

38. $f(x)=3x+\frac{2}{x}$. Find $f(\frac{1}{x})$. $f(\frac{1}{x})=3(\frac{1}{x})+\frac{2}{(\frac{1}{x})}=\frac{3}{x}+2x$

$f(\frac{1}{x})=\frac{3}{x}+2x$.

Chapter 1, Section 1

44. $f(x) = \sqrt{3x-5}$. If $g(x) = \sqrt{x}$ and $h(u) = 3u-5$, then

$$\begin{aligned} g(h(x)) &= g(3x-5) \\ &= \sqrt{3x-5} \\ &= f(x). \end{aligned}$$

48. $C(q) = q^3 - 30q^2 + 400q + 500$.
Cost for first 20 units is $C(20) = 20^3 - 30(20)^2 + 400(20) + 500$
$= 4500$.

Cost of the 20th unit is $C(20) - C(19) = 4500 - 19^3 - 30(19)^2 + 400(19) + 500$
$= 371$.

52. $f(n) = 3 + \frac{12}{n}$, n = trial #, $f(n)$ = time to finish maze on nth trial.

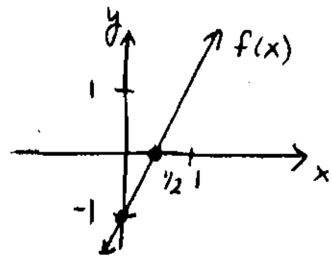
a) theoretical domain is all $n \neq 0$.
b) practical domain is all integers $n > 0$ n, so $n = 1, 2, 3, \ldots$
negative numbered trials, trial number zero, fractions, don't make sense.
c) on the third trial, time was $f(3) = 3 + \frac{12}{3} = 7$ minutes.
d) notice that as n gets larger, $\frac{12}{n}$ gets smaller, so time decreases with each trial. The 12th trial is completed in $f(12) = 3 + \frac{12}{12} = 4$ minutes. so $n = 12$ is the first to finish in 4 minutes or less.
e) In part(d), we noticed $f(n)$ consistently decreases with each trial. Time never reaches 3 minutes (always $3+$ something), but we can get as close as we like to 3 minutes by doing more & more trials.

Chapter 1, Section 2

6. $f(x) = 2x - 1$

   x-int: $(1/2, 0)$

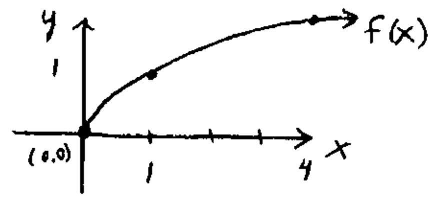
   y-int: $(0, -1)$



8. $f(x) = \sqrt{x}$

   x-int: $(0,0)$

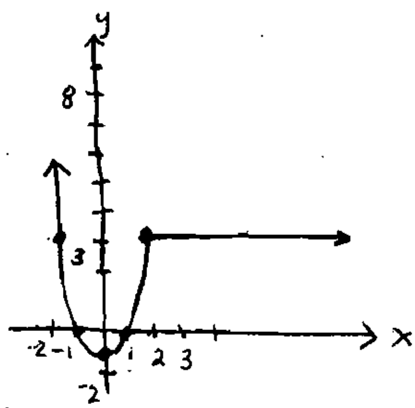
   y-int: $(0,0)$



10. $f(x) = \begin{cases} x^2 - 1 & x \le 2 \\ 3 & x > 2 \end{cases}$

    x-int: $(-1,0)$ and $(1,0)$

    y-int: $(0,-1)$



14. $f(x) = x^2 + 2x - 8$ (parabola)

    y-int: $y = 0 + 0 - 8$. $(0, -8)$

    x-int: $0 = x^2 + 2x - 8$

    $0 = (x+4)(x-2)$

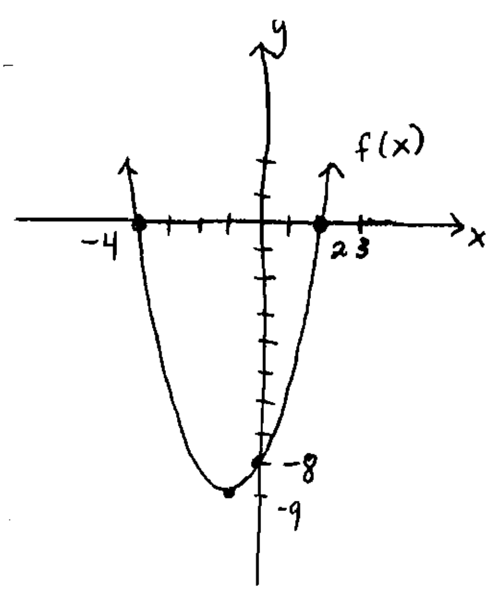
    $(-4, 0)$ and $(2, 0)$

    vertex at $x = -2/2(1) = -1$

    If $x = -1$, $y = (-1)^2 + 2(-1) - 8 = -9$

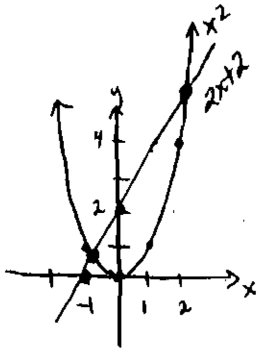
    $(-1, -9)$

    opens up.



Chapter 1, Section 2

20. Find intersection points of $y=x^2$ and $y=2x+2$.



If (x,y) is an intersection point, it's on both graphs and satisfies both equations, so $y=x^2=2x+2$.

$x^2=2x+2$, $\quad x^2-2x-2=0$

Use quadratic formula: $x=\dfrac{2\pm\sqrt{4+8}}{2}=\dfrac{2\pm2\sqrt{3}}{2}=1\pm\sqrt{3}$.

If $x=1+\sqrt{3}$, $y=2(1+\sqrt{3})+2 = 4+2\sqrt{3}$

If $x=1-\sqrt{3}$, $y=2(1-\sqrt{3})+2 = 4-2\sqrt{3}$.

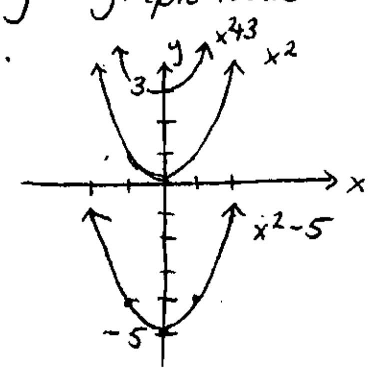
Intersection points: $(1+\sqrt{3},\ 4+2\sqrt{3})$, and $(1-\sqrt{3},\ 4-2\sqrt{3})$.

32. $y=x^2$, $y=x^2+3$

a) Second graph looks just like first one, only moved up 3 units.

b) Graph of $y=x^2-5$ looks like first one moved down 5 units.

c) If $g(x)=f(x)+c$, g's graph looks like f's graph, only moved up c units.

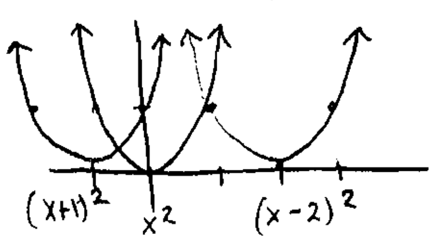


34. $y=x^2$, $y=(x-2)^2$

a) 2nd is first moved forward 2 units

b) $y=(x+1)^2$ looks like first moved back 1 unit.

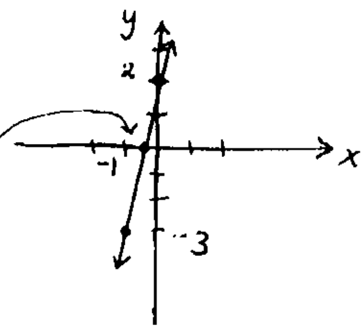
c) If $g(x)=f(x-c)$, g looks like f moved forward c units.



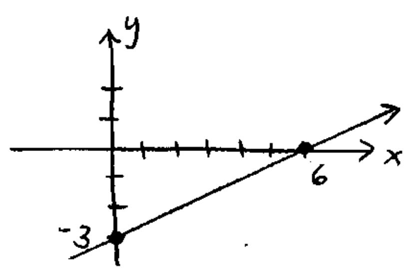
Chapter 1, Section 3

4. $(5,-1)$ and $(-2,-1)$. $m = \frac{-1-(-1)}{-2-5} = \frac{0}{-7} = 0.$

8. $y = 5x + 2$
slope $m = 5$
y-int: $(0,2)$
x-int: $(-2/5, 0)$

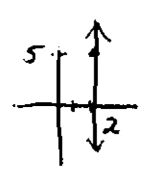


12. $2x - 4y = 12$
$4y = +2x - 12$
$y = \frac{1}{2}x - 3$
slope $m = \frac{1}{2}$
y-int: $(0,-3)$
x-int: $(6,0)$



20. $(-1,2)$, $m = 2/3$. $y - 2 = \frac{2}{3}(x+1)$
$y = \frac{2}{3}x + \frac{8}{3}$

24. $(2,5)$, parallel to y-axis:



$x = 2.$

30. $(1,5)$ and $(1,-4)$
$m = \frac{5+4}{1-1} = \frac{5+4}{0}$ undefined. $x = 1$

34. Through $(-\frac{1}{2}, 1)$, perp. to $2x + 5y = 3$
$5y = -2x + 3$
$y = -\frac{2}{5}x + \frac{3}{5}$

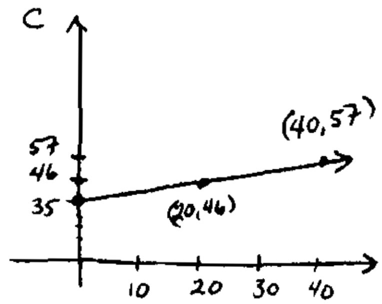
<u>our</u> slope is $m = 5/2$. $y - 1 = \frac{5}{2}(x + \frac{1}{2})$
$y = \frac{5}{2}x + \frac{9}{4}$

Chapter 1, Section 3

36. \$35 per day + .55 per mile.

a) Let x = # miles, then amount in a day is

$C(x) = 35 + .55x$



b) $C(50) = 35 + .55(50)$

$= 35 + 27.50$

$= \$62.50$

c) $72 = 35 + .55x$

$37 = .55x$

$67.27 \doteq x$ 67.27 miles, approx.

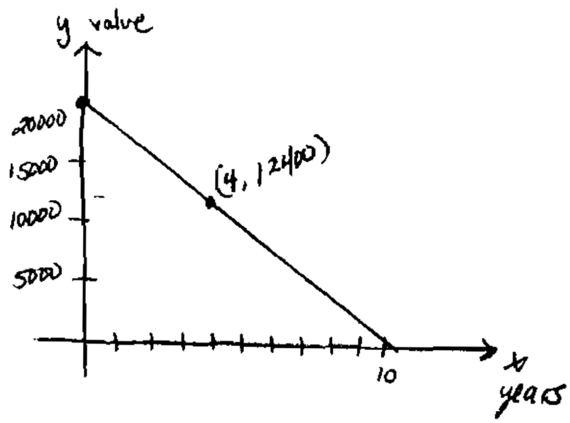
40. At year 0, value is \$20,000. At year 10, value is \$1000.

(0, 20000), (10, 1000).

a) $m = \frac{1000 - 20000}{10 - 0} = \frac{-19000}{10} = -1900$

$y - 20000 = -1900(x - 0)$

$y = -1900x + 20000.$



b) $y = -1900(4) + 20000$

$= \$12,400$

c) when is $y = 0$?

$0 = -1900x + 20000$

$1900x = 20000$

$x \doteq 10.526$ years

(discuss factors in deciding to sell equip.)

Chapter 1, Section 3

48. Ethyl alcohol is metabolized at a rate of 10 ml / hour.

a) $1 \text{ liter beer} \times \frac{1000 \text{ ml}}{1 \text{ liter}} \times \frac{.03 \text{ ml alcohol}}{1 \text{ ml beer}} \times \frac{1 \text{ hour}}{10 \text{ ml alcohol}}$

$= 3$ hours to metabolize

b) Time to metabolize $= A \text{ ml alcohol} \times \frac{1 \text{ hour}}{10 \text{ ml alcohol}} = \frac{A}{10}$

c) (discuss). If party is 4 hours long, maybe 30 ml ethyl alcohol could be allowed so it's mostly metabolized when party is over (30 ml ethyl alcohol is 1 liter of beer).