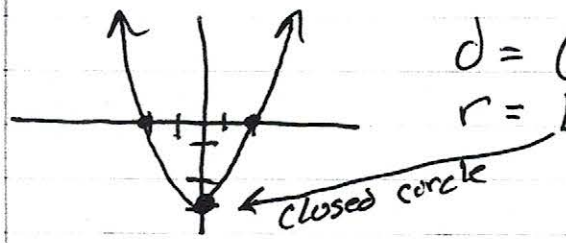
Pg 10
4-11 all
13, 14
18-27 all

1.1 Key Features of Functions

Domain - set of all x's
range - set of all y's
x-intercept - where the graph crosses the x-axes
y-intercept - where the graph crosses or touches the y-axis

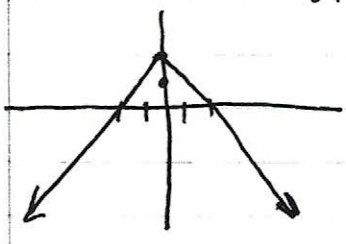
ex] What are the domain, range and intercepts of the function defined by $y = x^2 - 3$?



$d = (-\infty, \infty)$
$r = [-3, \infty)$

x intercepts
$(-2,0)$ $(2,0)$
y intercept
$(0,-3)$

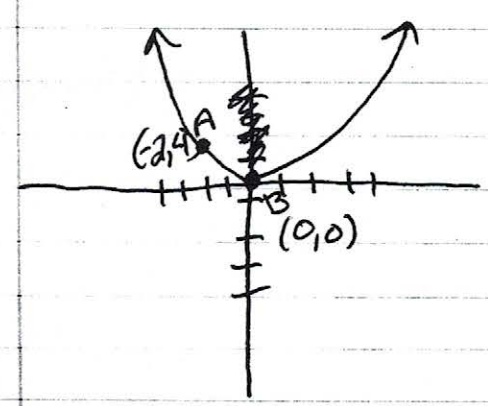
ex] For what values of x is $g(x) = 2 - |x|$ increasing? For what values is it decreasing?



* Read graph left to right *
increasing $(-\infty, 0)$
decreasing $(0, \infty)$

Average rate of change = Slope = $m = \frac{y_2 - y_1}{x_2 - x_1}$

ex] Find the average rate of change over the interval $[-2, 0]$



A to B is the interval

A $(-2,4)$ B $(0,0)$
(x_1, y_1) (x_2, y_2)

$\frac{0-4}{0-(-2)} = \frac{-4}{+2} = -2$

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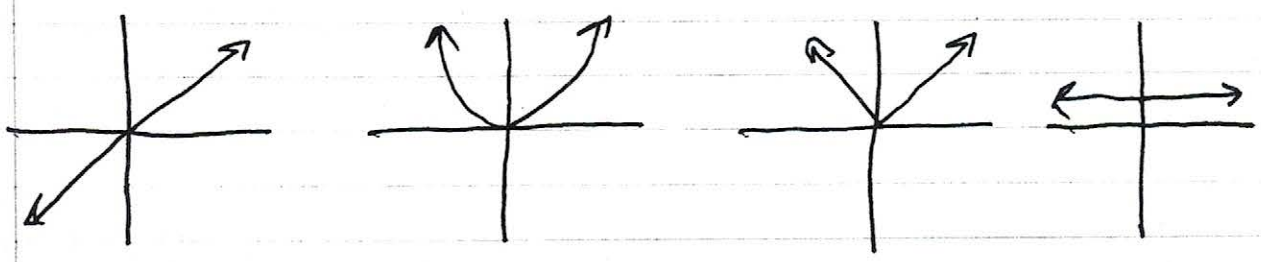
18-21 all
24-33 all

1.2 Transformations of Functions

Parent Functions

Linear	Quadratic	Absolute Value	Constant
$y=x$	$y=x^2$	$y=\|x\|$	$y=1$



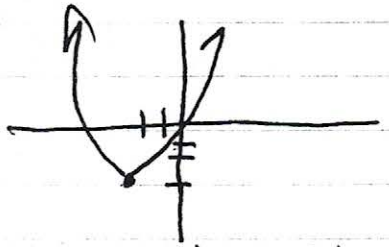
Translation - tells how the parent function moves

Quadratic
$y = a(x-h)^2 + k$

$a<1$ = stretch
$a>1$ = compression

a is a stretch or compression
h moves the parent function left or right
k moves the parent function up or down

ex] Draw a graph of a quadratic function that moves left 2 and down 3.



b) Write the function

$F(x) = (x-h)^2 + k$
$F(x) = (x-(-2))^2 - 3$
$F(x) = (x+2)^2 - 3$

ex] Describe the transformation of $f(x) = -\frac{2}{3}|x|+2$

$2/3$ = stretch
$-$ = reflection
$+2$ = up 2

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6-11 all
16,20

1.3 Piecewise Functions

$<$ or $>$ = open circle
$\leq$ or $\geq$ = closed circle

ex) Graph the following Piecewise function

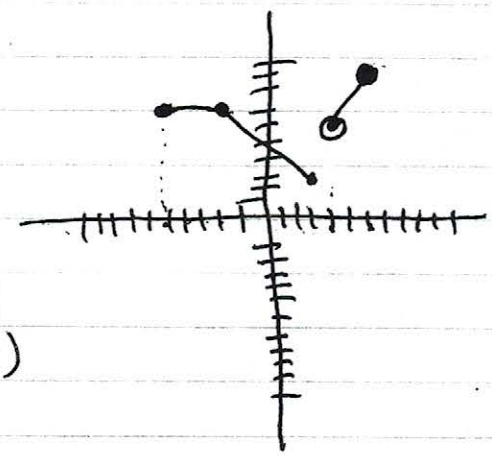
$$f(x)=\begin{cases} 7 & \text{if } -5 \leq x \leq -2 \quad 1. \\ 5-x & \text{if } -2 < x \leq 3 \quad 2. \\ 2x-3 & \text{if } 4 < x \leq 6 \quad 3. \end{cases}$$

1. $y=7$ if $-5 \leq x \leq -2$

x	y	
-5	7	(closed)
-2	7	(closed)

2. $y = 5-x$ if $-2 < x \leq 3$

x	y	
-2	$5-(-2)=7$	$(-2,7)$ (open)
3	$5-3=2$	$(3,2)$ (closed)



3. $y = 2x-3$ if $4 < x \leq 6$

x	y	
4	$2(4)-3=5$	$(4,5)$ (open)
6	$2(6)-3=9$	$(6,9)$ (closed)

b) Find the domain and range

$D = [-5,3]\ (4,6]$

$R = [7,2]\ (5,9]$

1.4 Arithmetic Sequence and Series

Arithmetic sequence - Common difference

ex] 3, 5, 7, 9, 11 ... The difference is constant so it is arithmetic sequence

ex] Write the recursive formula

$$a_n = \begin{cases} a_1, & n=1 \quad \text{(first term)} \\ a_{n-1} + d, & n>1 \end{cases}$$

$$a_n = \begin{cases} 3, & n=1 \\ a_{n-1} + 2, & n>1 \end{cases}$$

ex] Write the recursive formula for

4, 7, 10, 13, 16

$$a_n = \begin{cases} 4, & n=1 \\ a_{n-1} + 3, & n>1 \end{cases}$$

b) Write the explicit definition

$a_1 = 4$

$a_2 = 4+3$

$a_3 = 7+3$

$a_n = a_1 + d(n-1)$

c) Find the 5th term of the sequence

$a_n = 4 + 3(5-1)$

$= 4 + 3(4)$

$= 16$

d) Find the 10th term

$a_n = 4 + 3(10-1)$

$= 4 + 3(9)$

$= 4 + 27$

$= 31$

Over →

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5-11 all
17-30

Finding the sum of an Arithmetic Series

$S_n = \frac{n(a_1 + a_n)}{2}$

n = number of terms
a_1 = first term
a_n = last term

ex) What is the sum of the following arithmetic sequence?
2, 6, 10, 14, 18, 22

$S_n = \frac{6(2+22)}{2} = \frac{6(24)}{2} = 72$

b) series with 12 terms $a_1 = 3$ $a_{12} = 25$

$S_n = \frac{12(3+25)}{2} = \frac{12(28)}{2} = 168$

c) $\sum_{i=1}^{13} 3i + 2$

$\sum$ = sum (add everything up)

$n = 13$
$a_1 = 3(1)+2 = 5$
$a_n = 3(13)+2 = 41$

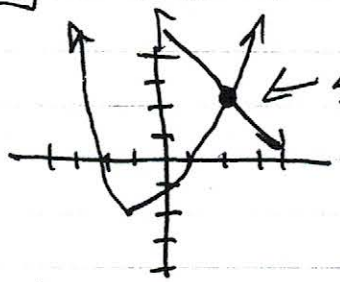
$S_n = \frac{13(5+41)}{2} = \frac{13(46)}{2} = 299$

Progress Check? → Pg 44 4,5 9-14 all 28

1.5 Solving Equations and Inequalities by Graphing

* To use a graph to solve an equation you find where the 2 graphs intersect *

ex| What is the solution?



(2,2)

Solving an equation

ex| $5x-12=3$

$+12 \quad +12$

$\frac{5x=15}{5 \quad 5}$

$x=3$

Absolute Value

b) $-\frac{|x-2|}{-1} = \frac{-\frac{1}{2}x-2}{-1}$

$|x-2| = \frac{1}{2}x+2$

$x-2=\frac{1}{2}x+2$ | $x-2=-\frac{1}{2}x-2$

$-2 \quad +2$ | $+\frac{1}{2}x \quad +\frac{1}{2}x$

$x=\frac{1}{2}x+4$ | $\frac{3}{2}x-2=-2$

$-\frac{1}{2}x \quad -\frac{1}{2}x$ | $+2 \quad +2$

$\frac{1}{2}x=4$ | $\frac{3}{2}x=0$

$x=8$ | $x=0$

pg 52
2, 6, 8, 11
16-19
28, 29

1.6 Linear Systems

ex) $2x + y = -1$
$5y - 6x = 7$

★ make sure variables line up ★

$y + 2x = -1$

$5y - 6x = 7$
$(y + 2x = -1)\ -5$
$-5y - 10x = +5$

★ multiply both equations by a number to make a variable cancel ★

$5y - 6x = 7$
$-16x = 12$
$\frac{-16x}{-16} = \frac{12}{-16}$
$x = -3/4$

$2(-3/4) + y = -1$
$-6/4 + y = -1$
$+6/4 \quad +6/4$
$y = -2/4$ $\quad y = -1/2$

$5y - 6(-3/4) = 7$
$5y + 4.5 = 7$
$5y = 2.5$ $\quad y = 1/2$

b) $x + 2y = 3$
$x - 2y = 4$

★ Don't need to multiply because y cancels ★

$\frac{2x}{2} = \frac{7}{2}$
$x = 7/2$

$x + 2y = 3$
$\frac{7}{2} + 2y = 3$
$-\frac{7}{2} \quad -7/2$
$\frac{2y}{2} = \frac{-1/2}{2}$
$y = -1/4$

$(7/2, -1/4)$

over →

ex] write augmented matrix from the system

$3x - 2y = 4$
$7x - 9y = 3$

$\rightarrow \begin{bmatrix} 3 & -2 & 4 \\ 7 & -9 & 3 \end{bmatrix}$

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1.6 3x3

ex) $4x+2y+3z=1$ ①
$2x-3y+5z=-14$ ②
$6x-y+4z=-1$ ③

Step 1 - Eliminate 1 variable from 2 equations

② $(2x-3y+5z=-14)-3$
③ $6x-y+4z=-1$
$-6x+9y-15z=42$
$8y-11z=41$

Step 2 - Eliminate same variable from equation not used

① $4x+2y+3z=1$
② $(2x-3y+5z=-14)-2$
$-4x+6y-10z=28$
~~$0+13z=29$~~ $8y-7z=29$

Step 3 - Combine Step 1 and Step 2

$(8y-11z=41)-1$
$8y-7z=29$
$-8y+11z=-41$
$4z=-12$
$z=-3$

Step 4 - Plug Step 3 into Step 1 or Step 2

$8y-11z=41$
$8y-11(-3)=41$
$8y+33=41$
$-33\ \ -33$
$8y=8$
$y=1$

Step 5 - Plug Step 3 and 4 into original system

$4x+2y+3z=1$
$4x+2(1)+3(-3)=1$
$4x+2-9=1$
$4x-7=1$
$4x=8$
$x=2$

Pg 62
5, 6, 12, 17-26

1.7 Solve Linear Systems Using Matrices

ex1 Find the RREF of the following:
* RREF means use elimination or graphing Calculator #

a) $\begin{bmatrix} 3 & -2 & 25 \\ 2 & 5 & 4 \end{bmatrix}$

$(3x-2y=25)-2$
$(2x+5y=4)3$

$-6x+4y=-50$
$6x+15y=12$
$19y=-38$
$y=-2$

$3x-2y=25$
$3x-2(-2)=25$
$3x+4=25$
$-4\ \ -4$
$3x=21$
$x=7$

Pg 62 #5
$-x+2y=-2$
$x=6y$ – substitute, no need to make matrix
$-6y+2y=-2$
$\frac{-4y}{-4}=\frac{-2}{-4}$
$y=1/2$

$x=6y$
$x=6(1/2)$
$x=3$