Graphing Linear Piecewise Functions

Notes

REVIEW

ex: Graph. Then state the domain and range.

a) $f(x) = 3x - 2$

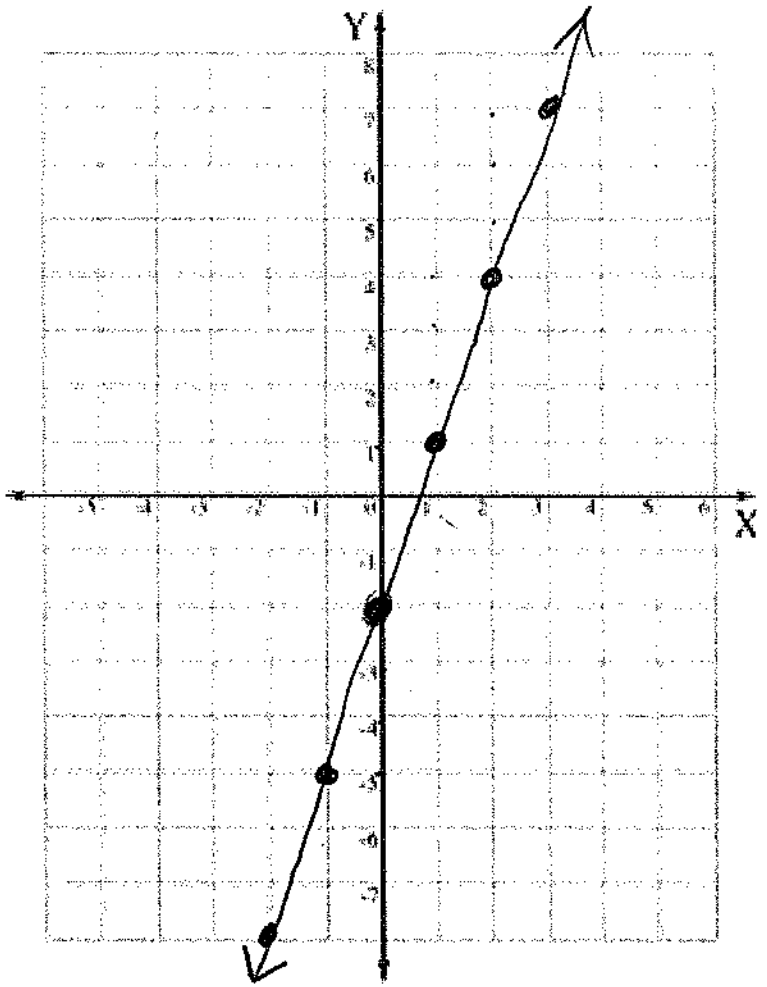
slope intercept form

$y = mx + b$

$m = 3 = \frac{3}{1} = \frac{-3}{-1}$

y-int: $(0, b)$ $b = -2$

$(0, -2)$



Domain:	Range:
$\{x \mid x \in R\}$ $(-\infty, \infty)$	$\{y \mid y \in R\}$ $(-\infty, \infty)$
SET INT	SET INT

REVIEW

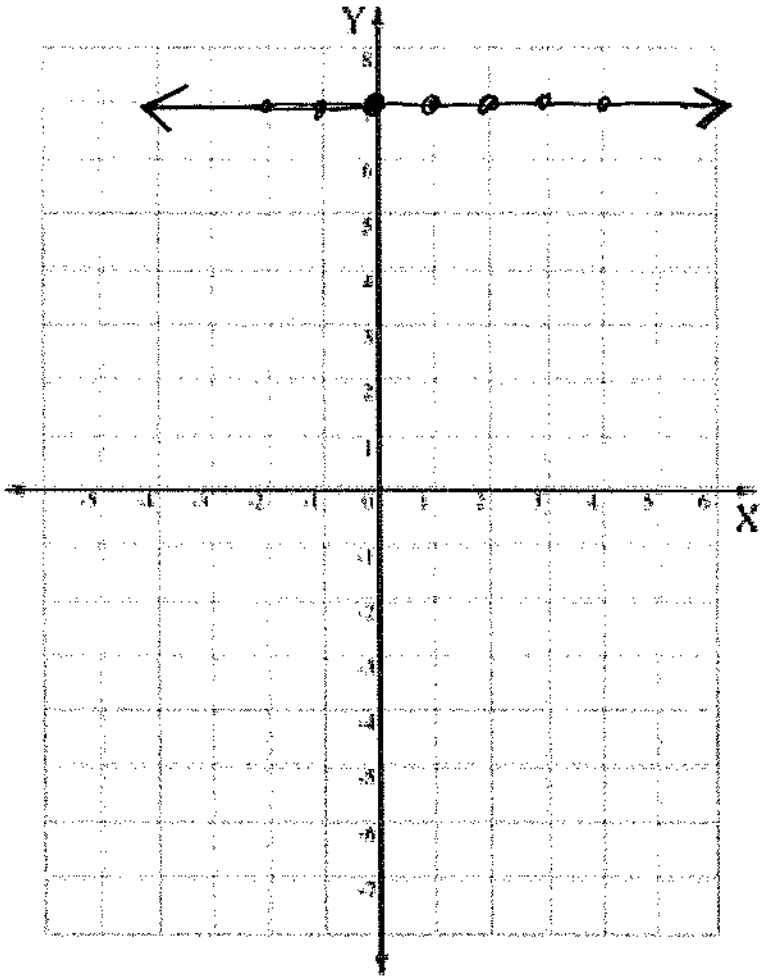
ex: Graph. Then state the domain and range.

b) $f(x) = 7$

$y = 7$ Horizontal line

↑

y is always "7"



$y = 0x + 7$ $\boxed{m=0}$

$y = mx + b$ y-int: $\boxed{(0,7)}$

Domain:	Range:
$\{x \mid x \in R\}$ $(-\infty, \infty)$	$\{y \mid y = 7\}$ $[7, 7]$
set INT	set INT

ex: Graph. Then state the domain and range.

a) $f(x)=\begin{cases} x+1, & x \le -2 \\ 2x+5, & x > -2 \end{cases}$

function must pass VLT

Piecewise (2 pieces here)
Function

$f(x)=x+1 \quad x \le -2$ (Less/=)

X	X+1
-2	-1
-3	-2
-4	-3
-5	-4

• closed

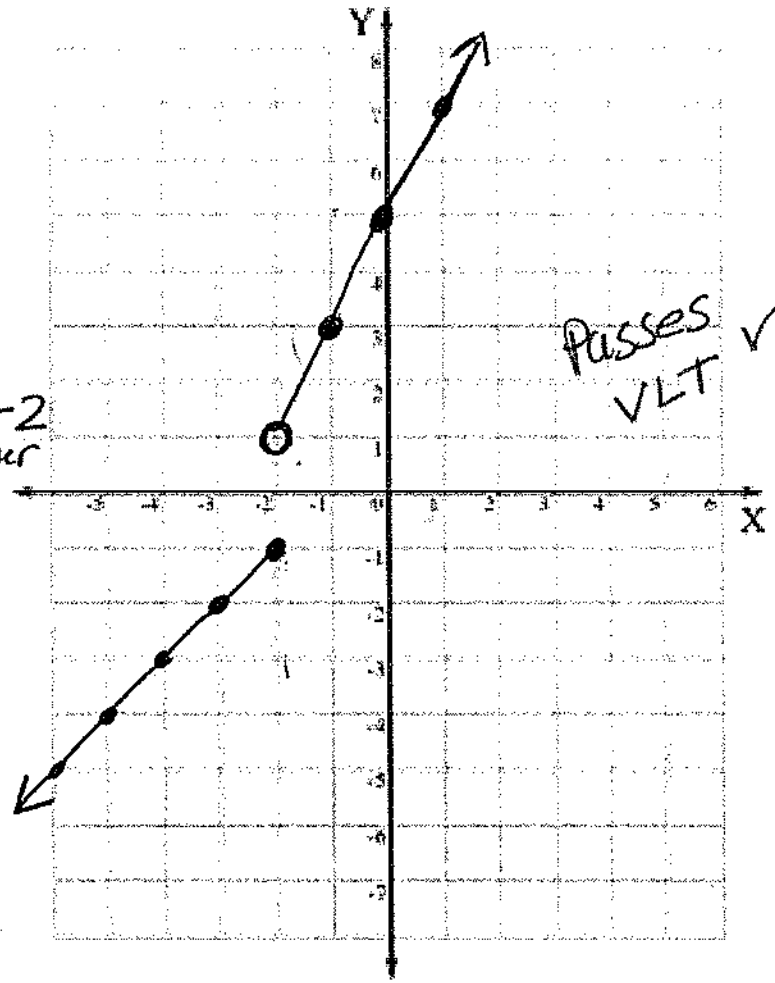
↓ continue pattern

$f(x)=2x+5 \quad x>-2$ (greater)

X	2X+5
-2	1
-1	3
0	5
1	7

○ open

↓ continues



passes VLT ✓

Domain:	Range:
$\{x \mid x \in R\}$ $(-\infty, \infty)$	$\{y \mid y \le -1 \text{ or } y > 1\}$
set INT	set

$(-\infty, -1] \cup (1, \infty)$

ex: Graph. Then state the domain and range.

b) $$f(x)=\begin{cases}2x+1, & x<1\\ -2x+3, & x\geq 1\end{cases}$$

$f(x)=2x+1$ $x<1$ (less)

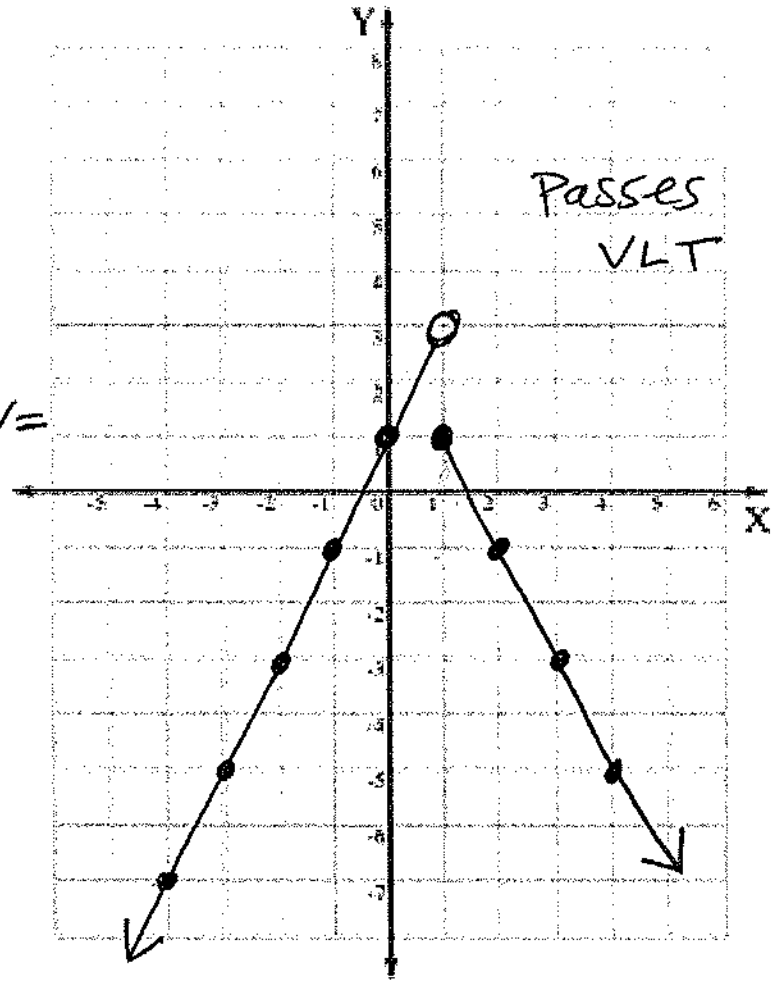
x	2x+1
1	3
0	1
-1	-1
-2	-3
↓	

o open

$f(x)=-2x+3$ $x\geq 1$ (greater/=)

x	-2x+3
1	1
2	-1
3	-3
↓	

• closed



Domain:	Range:
$\{x \mid x\in R\}$ set $(-\infty,\infty)$ INT	$\{y \mid y<3\}$ set $(-\infty,3)$ INT

~~$(3,-\infty)$~~ must be Least to Greatest

ex: Graph. Then state the domain and range.

c)

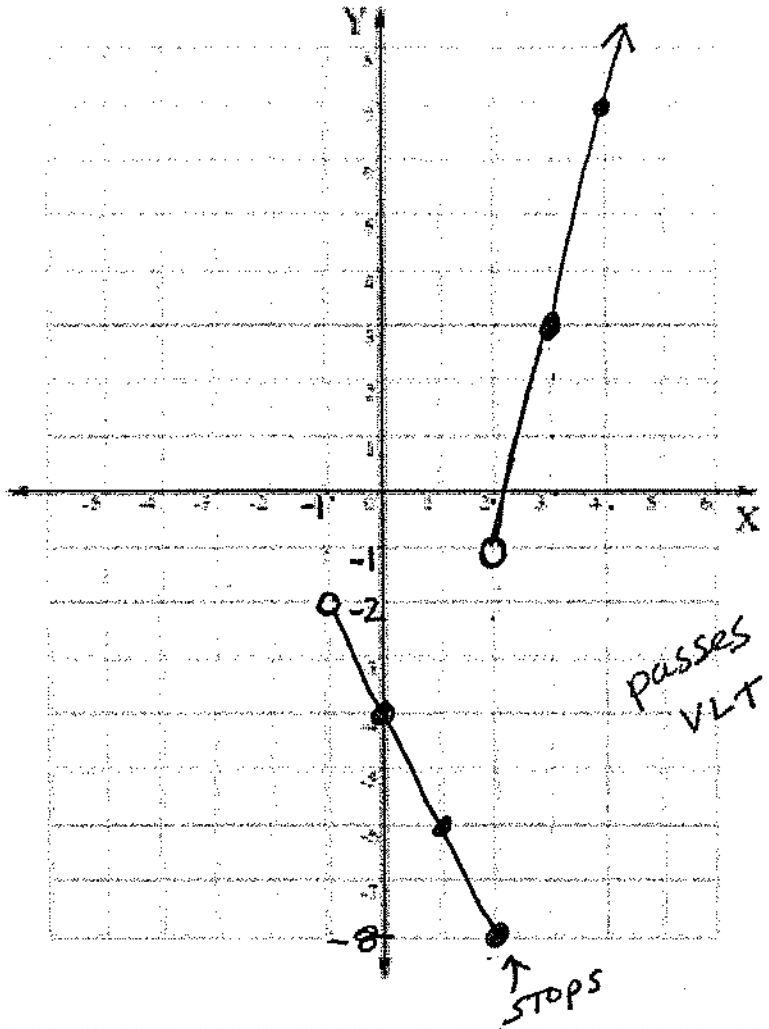
$$f(x)=\begin{cases}-2x-4, & -1<x\le 2\\ 4x-9, & x>2\end{cases}$$

$f(x) = -2x-4 \quad -1<x\le 2$ Btwn

x	-2x-4	
-1	-2	open
0	-4	
1	-6	
2	-8	closed

$f(x) = 4x-9, \quad x>2$ greater

x	4x-9	
2	-1	open
3	3	
4	7	
↓		

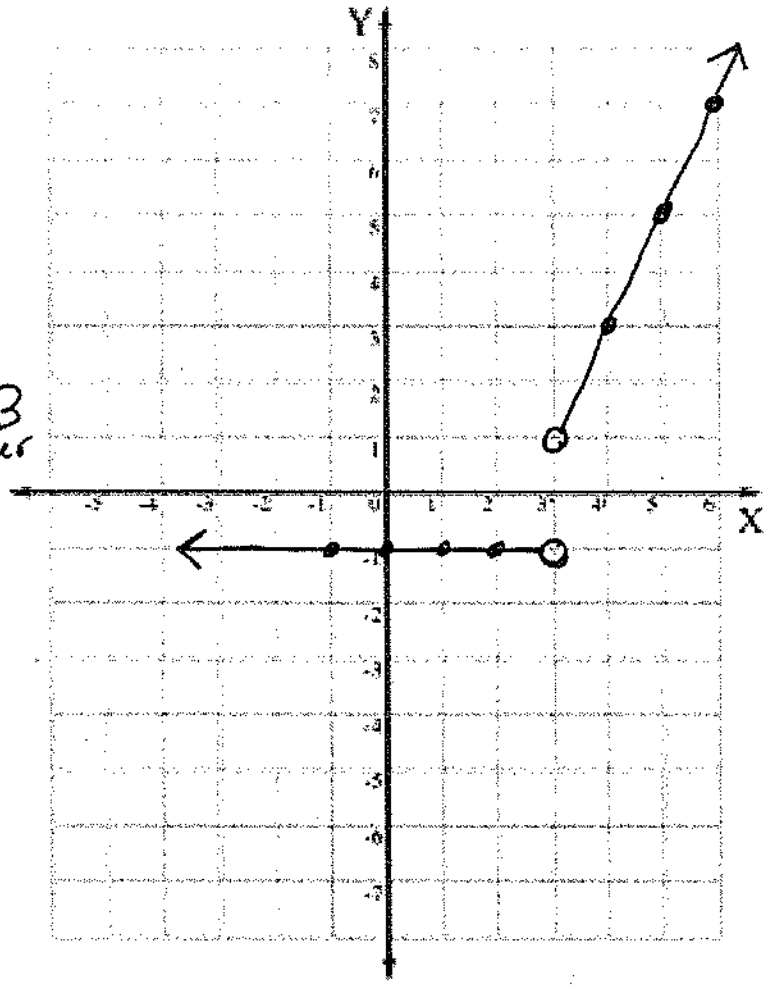


Domain:	Range:
$\{x \mid x>-1\}$ SET $\quad (-1,\infty)$ INT	$\{y \mid -8\le y<-2 \text{ or } y>-1\}$ SET

$[-8,-2)\cup(-1,\infty)$

ex: Graph. Then state the domain and range.

d) $$f(x)=\begin{cases}-1, & x<3\\ 2x-5, & x>3\end{cases}$$



Horizontal line

$f(x)=-1$, $x<3$

X	-1
3	-1
2	-1
1	-1
0	-1
-1	-1

↓

Less

open

$f(x)=2x-5$, $x>3$

X	2X-5
3	1
4	3
5	5
6	7

↓

greater

open

Domain:	Range:
$\{x \mid x<3 \text{ or } x>3\}$	$\{y \mid y=-1 \text{ or } y>1\}$
SET	SET

INT

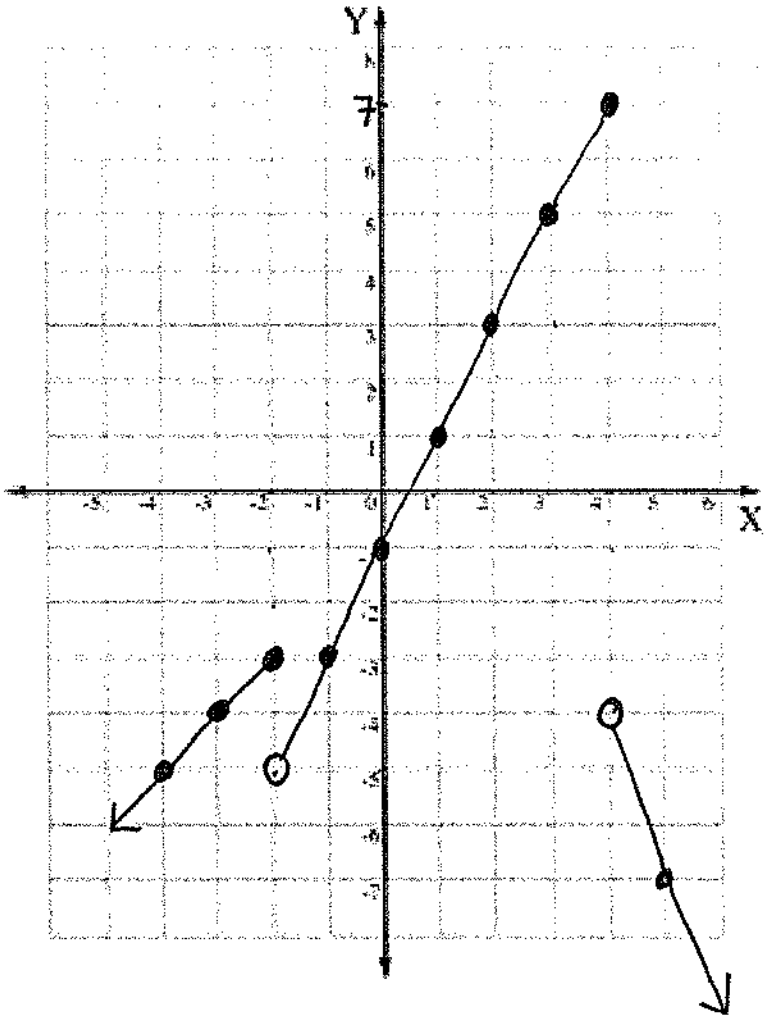
* $\{x \mid x \neq 3\}$ $(-\infty,3)\cup(3,\infty)$

INT

$[-1,-1]\cup(1,\infty)$

ex: Graph. Then state the domain and range.

e)
$$f(x)=\begin{cases} x-1, & x\le -2 \\ 2x-1, & -2<x\le 4 \\ -3x+8, & x>4 \end{cases}$$



$f(x)=x-1$, $x\le -2$ (less/=)

X	X-1
-2	-3
-3	-4
-4	-5

closed

↓

$f(x)=2x-1$ $-2<x\le 4$ (Btwn)

X	2X-1
-2	-5
-1	-3
0	-1
1	1
2	3
3	5
4	7

○ open

• closed

$f(x)=-3x+8$ $x>4$ (greater)

X	-3X+8
4	-4
5	-7
6	-10

open

↓

Domain:		Range:	
$\{x \mid x\in R\}$	$(-\infty,\infty)$	$\{y \mid y<7\}$	$(-\infty,7]$
SET	INT	SET	INT

ex: Graph. Then state the domain and range.

f)
$$f(x)=\begin{cases}3x-4, & x<0\\ 5x-2, & x=0\\ x+1, & x>0\end{cases}$$

only one point

$f(x)=3x-4$, $x<0$ (less)

x	3x−4
0	−4
−1	−7
−2	−10
↓	

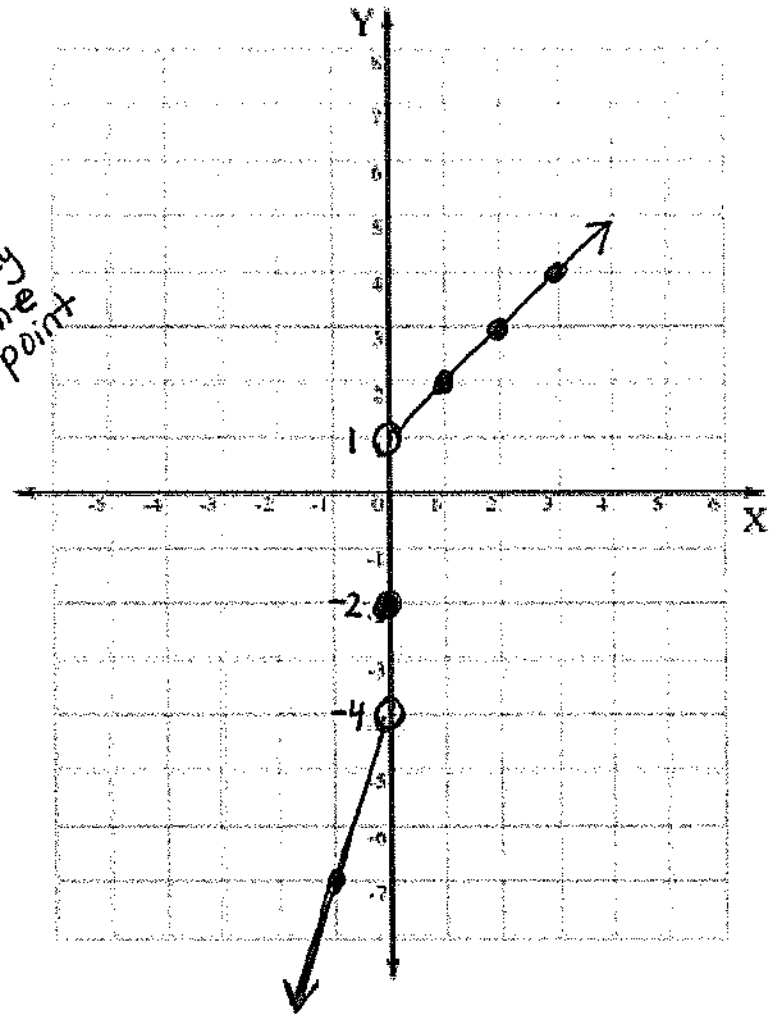
open

$f(0)=5(0)-2$
$=0-2$
$=-2$
$(0,-2)$ point

$f(x)=x+1$, $x>0$ (greater)

x	x+1
0	1
1	2
2	3
↓	

open



Domain:	Range:
$\{x \mid x\in R\}$ SET $(-\infty,\infty)$ INT	$\{y \mid y<-4 \text{ or } y=-2 \text{ or } y>1\}$ SET

$(-\infty,-4)\cup[-2,-2]\cup(1,\infty)$

REVIEW

ex: Simplify.

$$6 \div 2(1+2)$$

$$6 \div 2(3) \quad \text{L} \rightarrow \text{R}$$

$$3(3)$$

$$\boxed{9}$$

REVIEW

ex: Evaluate.

$$f(x) = -x^2 - 2x - 4; \quad f(-3)$$

$$f(-3) = -(-3)^2 - 2(-3) - 4$$

$$= -[(-3)(-3)] - 2(-3) - 4$$

$$= -[9] - 2(-3) - 4$$

$$= -9 + 6 - 4$$

$$= -3 - 4$$

$$f(-3) = \boxed{-7}$$

REVIEW

ex: Solve. Express the answer in interval notation.

$$\frac{2}{3}x + 5 \leq 7$$

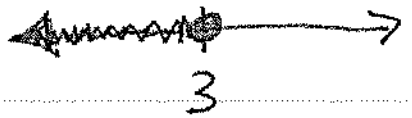
$$-5 \quad -5$$

$$\frac{2}{3}x \leq 2$$

$$\frac{3}{2} \cdot \frac{2}{3}x \leq \frac{2}{1} \cdot \frac{3}{2}$$

$$x \leq \frac{6}{2}$$

$$\boxed{x \leq 3}$$



$$\boxed{(-\infty, 3]}$$

Interval notation