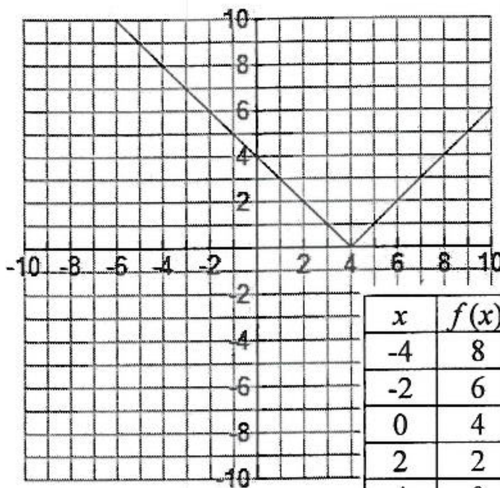
Transform Absolute Value Graphs

Name **ANSWERS**

Directions: Use your graphing calculator to examine absolute value graphs.

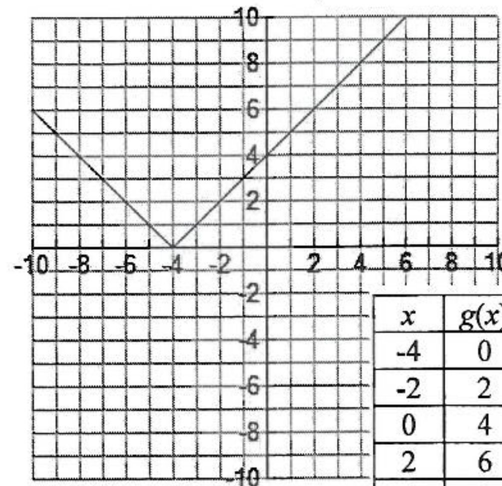
1. Graph the following absolute value equations and complete the table entries as shown.

$f(x) = |x - 4|$



x	$f(x)$
-4	8
-2	6
0	4
2	2
4	0

$g(x) = |x + 4|$



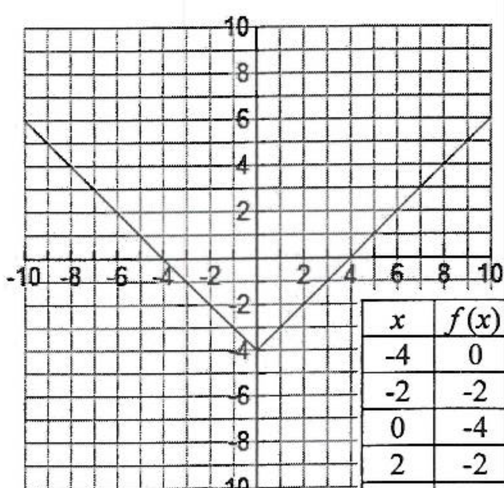
x	$g(x)$
-4	0
-2	2
0	4
2	6
4	8

2. Based upon your observations from question #1, describe how the value "h" affects the graph of the equation $y = |x - h|$. Consider values where $h > 0$ and $h < 0$.

When h is < 0, the "parent" graph experiences a horizontal shift to the left h units.
When h is > 0, the "parent" graph experiences a horizontal shift to the right h units.

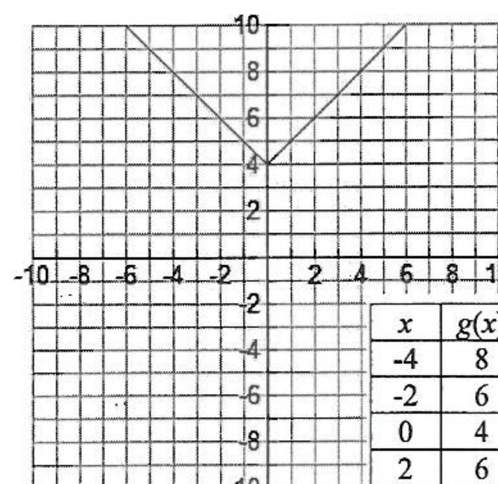
3. Graph these new absolute value equations and complete the table entries as shown.

$f(x) = |x| - 4$



x	$f(x)$
-4	0
-2	-2
0	-4
2	-2
4	0

$g(x) = |x| + 4$



x	$g(x)$
-4	8
-2	6
0	4
2	6
4	8

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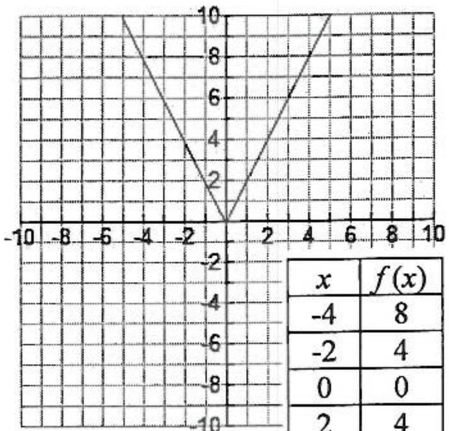
4. Based upon your observations from question #3, describe how the value "k" affects the graph of the equation $y=|x|+k$. Consider values where $k>0$ and $k<0$.

When k is <0, the "parent" graph experiences a vertical shift downward k units.
When k is >0, the "parent" graph experiences a vertical shift upward k units.

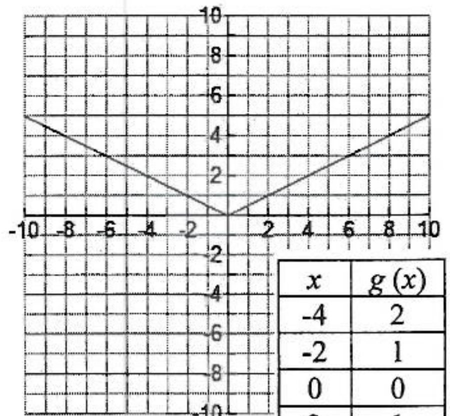
5. Now graph these absolute value equations and complete the table entries as shown.

$f(x)=2|x|$



x	$f(x)$
-4	8
-2	4
0	0
2	4
4	8

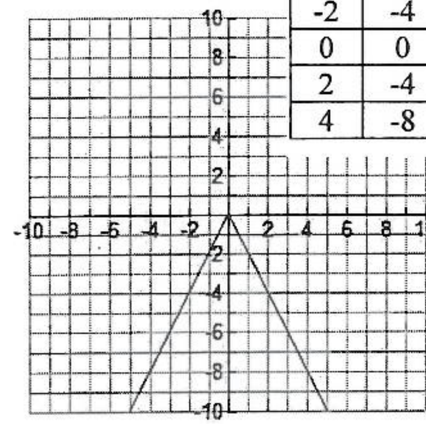
$g(x)=\frac{1}{2}|x|$



x	$g(x)$
-4	2
-2	1
0	0
2	1
4	2

$h(x)=-2|x|$

x	$h(x)$
-4	-8
-2	-4
0	0
2	-4
4	-8



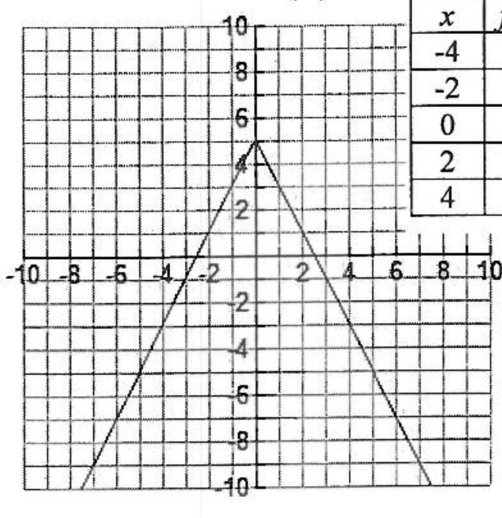
6. Based upon your observations from question #5, describe how the value "a" affects the graph of the equation $y=a|x|$. Consider values where $a>1$, $0<a<1$, and $a<0$

When a is >1, the "parent" graph experiences a vertical stretch. When $0<a<1$, the "parent" graph experiences a vertical compression. When a is <0, the graph also experiences a reflection in the x-axis. Consider $-a$ to be $(-1)a$, where a determines stretch or compress, and (-1) determines reflection.

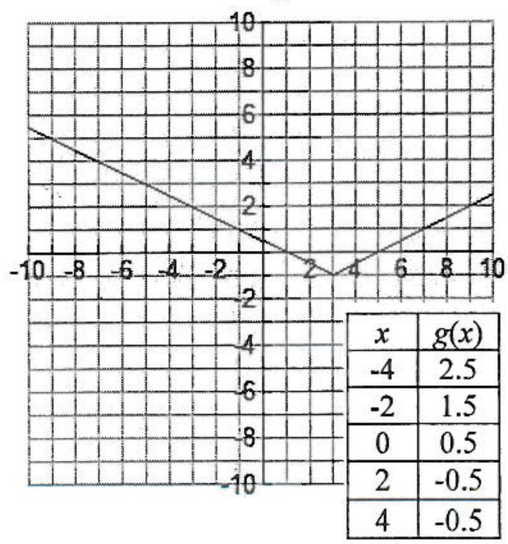
7. Using your knowledge of the effect of a, h, and k on the equation $y=a|x-h|+k$, graph the following functions without the use of your calculator. Use your calculator to check your answer.

$f(x)=-2|x|+5$

x	$f(x)$
-4	-3
-2	1
0	5
2	1
4	-3



$g(x)=\frac{1}{2}|x-3|-1$



x	$g(x)$
-4	2.5
-2	1.5
0	0.5
2	-0.5
4	-0.5

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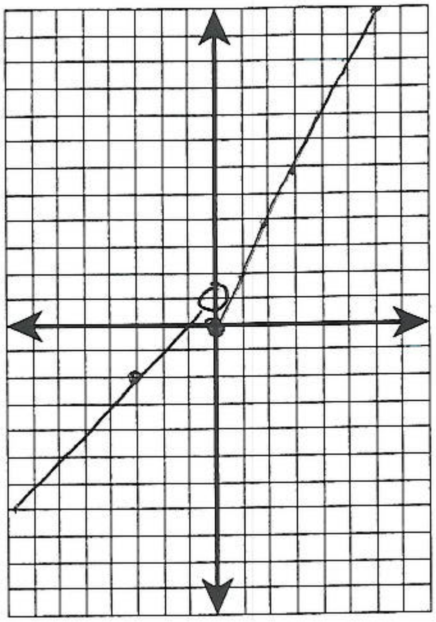
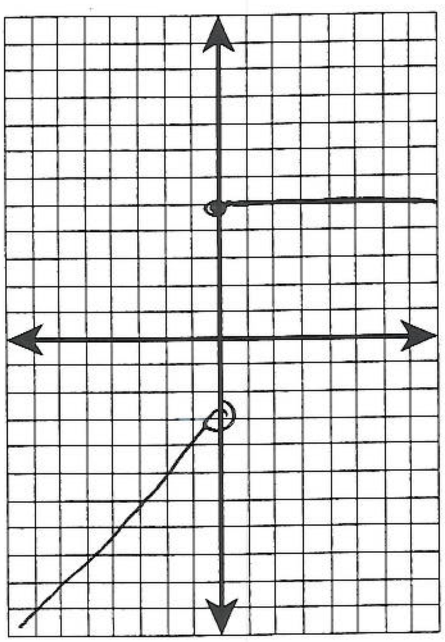
Graph each function. In each case, give any points of discontinuity. Then fill in the function property charts.

1. $f(x) = \begin{cases} x + 1, if\ x < 0 \\ 2x, \quad if\ x \geq 0 \end{cases}$



Domain	ℝ
Range	ℝ
Inc Int	$(-\infty, \infty)$
Dec Int	–
Symmetry	–
Boundedness	Not bounded
Max	–
Min	Relative 0
HA	–
VA	–
REB	$\lim_{x \to \infty} f(x) = \infty$
LEB	$\lim_{x \to -\infty} f(x) = -\infty$

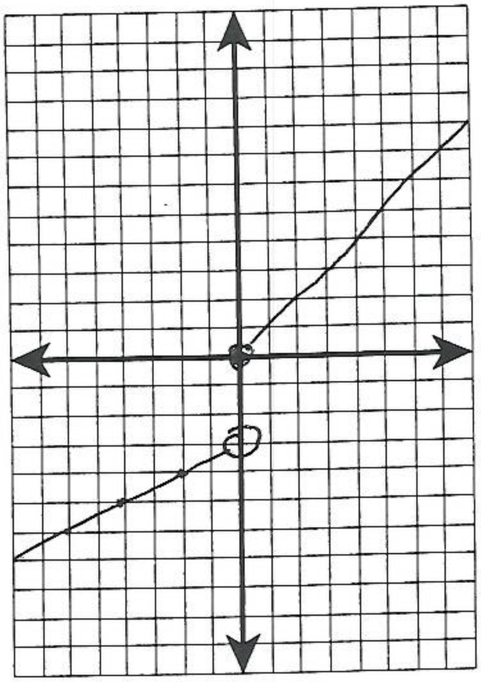
2. $f(x) = \begin{cases} x - 3, \ if\ x < 0 \\ 5, \quad if\ x \geq 0 \end{cases}$



Domain	ℝ
Range	$(-\infty, -3) \cup 5$
Inc Int	$(-\infty, 0)$
Dec Int	–
Symmetry	–
Boundedness	Bounded above
Max	~~Relative~~ 5 Absolute
Min	Relative 5
HA	–
VA	–
REB	$\lim_{x \to \infty} f(x) = 5$
LEB	$\lim_{x \to -\infty} f(x) = -\infty$

5

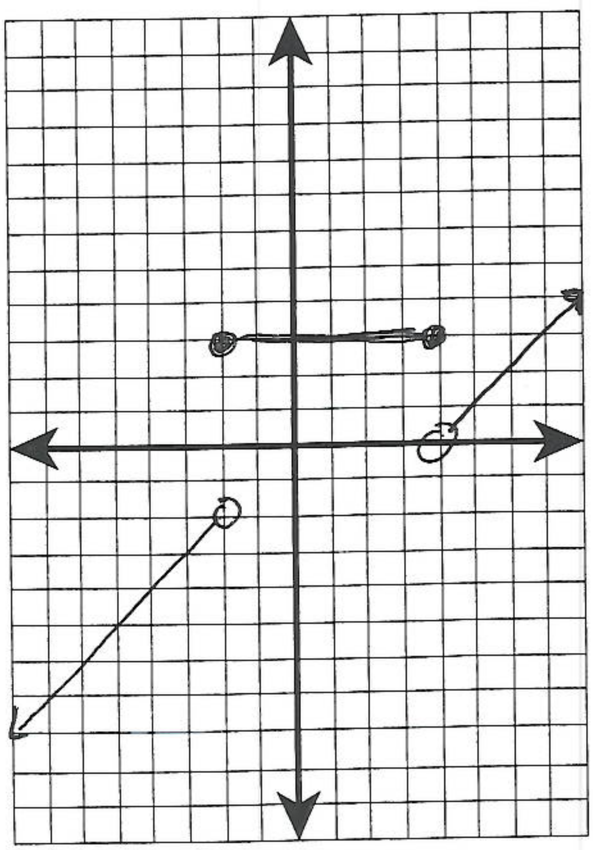
3. $f(x) = \begin{cases} .5x - 3, & if\ x < 0 \\ x, & if\ x \geq 0 \end{cases}$



Domain	$\mathbb{R}$
Range	$(-\infty, -3) \cup [0, \infty)$
Inc Int	$(-\infty, \infty)$
Dec Int	—
Symmetry	—
Boundedness	Not bounded
Max	—
Min	Relative 0
HA	—
VA	—
REB	$\lim_{x\to\infty} f(x) = \infty$
LEB	

$\lim_{x\to -\infty} f(x) = -\infty$

4. $f(x) = \begin{cases} x, & if\ x < -2 \\ 3, if & -2 \leq x \leq 4 \\ x - 4, & if\ x > 4 \end{cases}$



Domain	$\mathbb{R}$
Range	$(-\infty, -2) \cup (0, \infty)$
Inc Int	$(-\infty, -2) \cup (4, \infty)$
Dec Int	—
Symmetry	—
Boundedness	Not bounded
Max	Relative 3
Min	Relative 3
HA	—
VA	—
REB	$\lim_{x\to\infty} f(x) = \infty$
LEB	

$\lim_{x\to -\infty} f(x) = -\infty$