

1. Complete the summary below:

To Graph:

Draw the graph of f and :

Functional Change of $f(x)$

1. Vertical Shifts:

$y = f(x) + K, K > 0$

Raise $f(x)$ by K units

Add K to $f(x)$

$y = f(x) - K, K < 0$

Lower $f(x)$ by K units

Subtract K from $f(x)$

Horizontal shifts:

$y = f(x+h), h > 0$

Shift $f(x)$ (L) h units

Replace (x) by $(x+h)$

$y = f(x-h), h > 0$

Shift $f(x)$ (R) h units

Replace (x) by $(x-h)$

2. Compressions or stretching:

$y = a \cdot f(x), a > 0$

Mult each y -coord ^{of $f(x)$} by a

Multiply $f(x)$ by a

Stretches $f(x)$ vertically if $a > 1$

Compress $f(x)$ vertically if $0 < a < 1$

$y = f(ax), a > 0$

Mult each x -coord ^{of $f(x)$} by $\frac{1}{a}$

Replace (x) by (ax)

Stretch $f(x)$ horizontally if $0 < a < 1$

Compress $f(x)$ horizontally if $a > 1$

3. Reflections over the x-axis:

$y = -f(x)$

Reflect $f(x)$ abt x -axis

Mult $f(x)$ by (-1)

Reflections over the y-axis

$y = f(-x)$

Reflect $f(x)$ abt y -axis

Replace (x) by $(-x)$

3. Find the function for $f(x) = |x|$ if you :

A. shift left 2 units $|x+2|$

B. shift up 3 units $|x+2|+3$

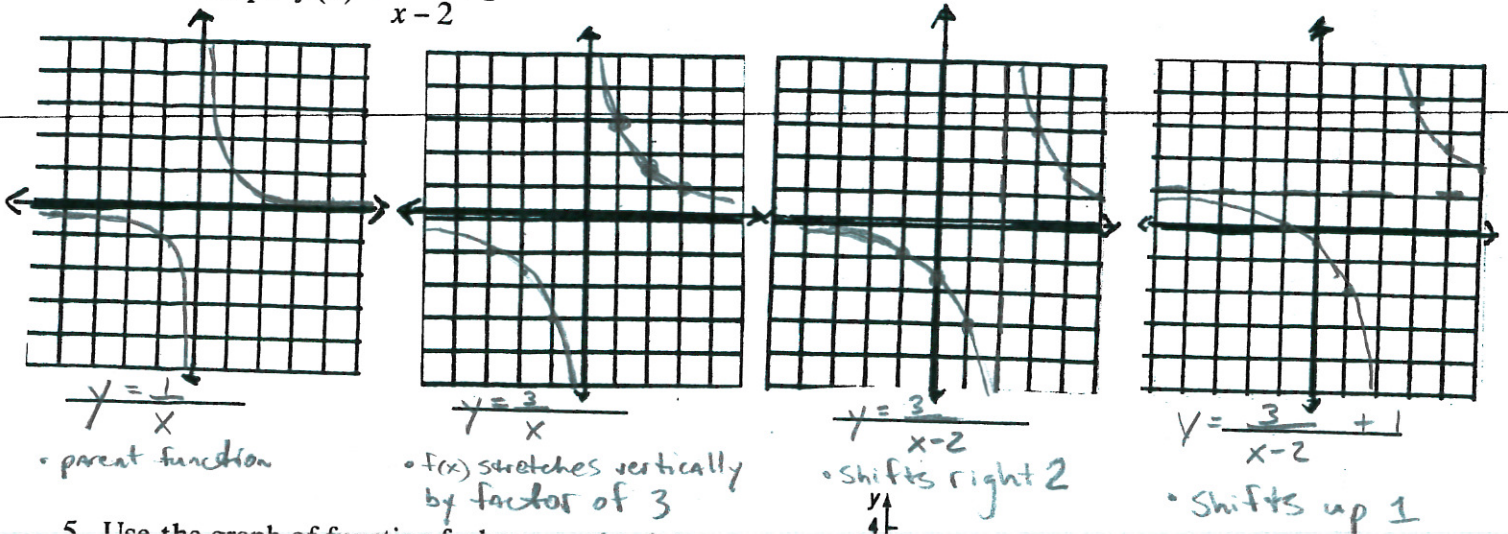
C. reflect over the y-axis

$| -x+2|+3$

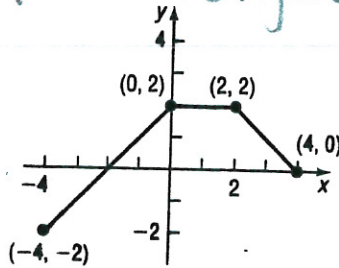
$f(x) = |-x+2|+3$

$|-(x-2)|+3$

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



5. Use the graph of function f shown to the right to graph each of the following:

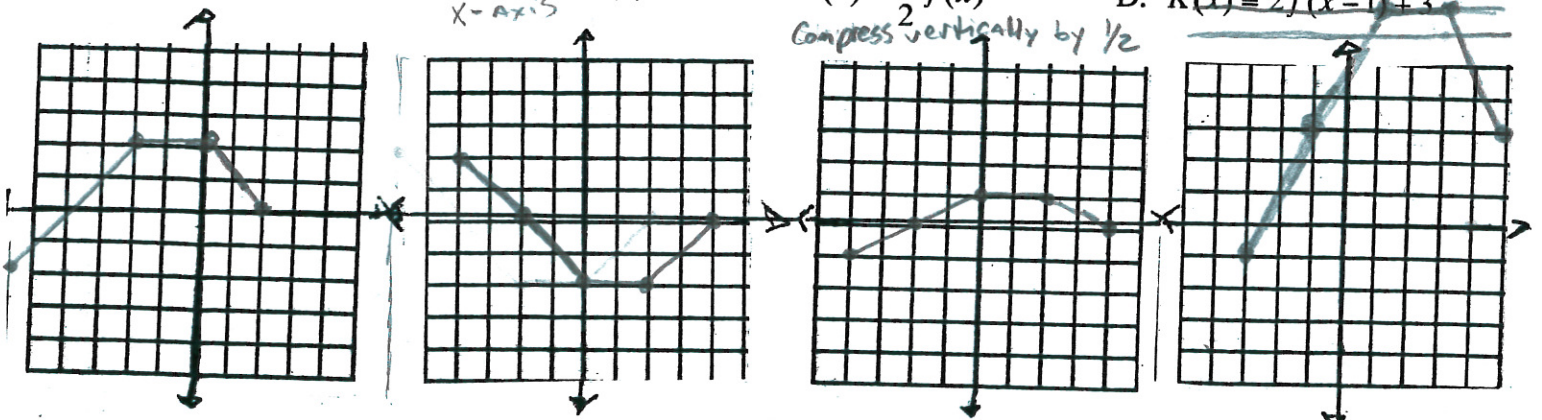


① 2
A. $G(x) = f(x+2)$

reflect across
x-axis
B. $H(x) = -f(x)$

C. $J(x) = \frac{1}{2}f(x)$
Compress vertically by $\frac{1}{2}$

stretch vertically by 2
shift $K(x)$ ① 1
shift $K(x)$ up 3
D. $K(x) = 2f(x-1) + 3$

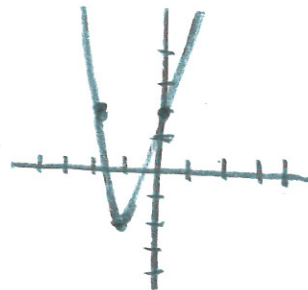


6. Complete the square of $f(x) = 3x^2 + 6x + 1$, then write steps to graph and finally manually graph below:

$$3x^2 + 6x = -1$$

$$3(x^2 + 2x + 1) = -1 + 3$$

$$3(x+1)^2 = 2$$



$f(x) = 3(x+1)^2 - 2$

Horizontal shift ① 1
vertical stretch by 3
vertical shift down 2