p 041 q15

## Extend

**15.** If the $x$-intercept of the graph of $y = f(x)$ is located at $(a, 0)$ and the $y$-intercept is located at $(0, b)$, determine the $x$-intercept and $y$-intercept after the following transformations of the graph of $y = f(x)$.

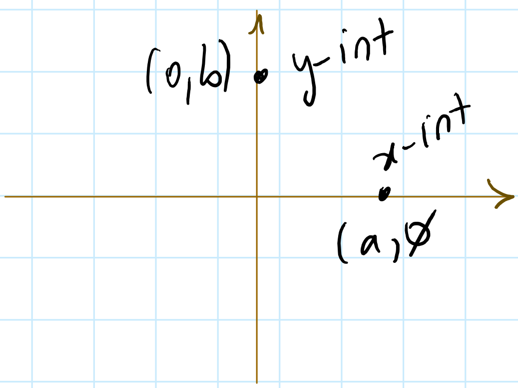
**a)** $y = -f(-x)$

**b)** $y = 2f\left(\frac{1}{2}x\right)$

**c)** $y + 3 = f(x - 4)$

**d)** $y + 3 = \frac{1}{2}f\left(\frac{1}{4}(x - 4)\right)$

these may be new values not the result of a transformation




a) $y = -f(-x)$

$(a, 0) \rightarrow (-a, 0)$ new x-int

$(0, b) \rightarrow (0, -b)$ new y-int

} these continue to function as intercept b/c of their ∅ counterparts

$(-a, 0)$ & $(0, -b)$

b) $y = 2f(\frac{1}{2}x) \Rightarrow (x, y) \rightarrow (2x, 2y)$

$f(\frac{1}{2}x) \Rightarrow$ a horiz. mapping by a factor of 2

continues to be a y-int.

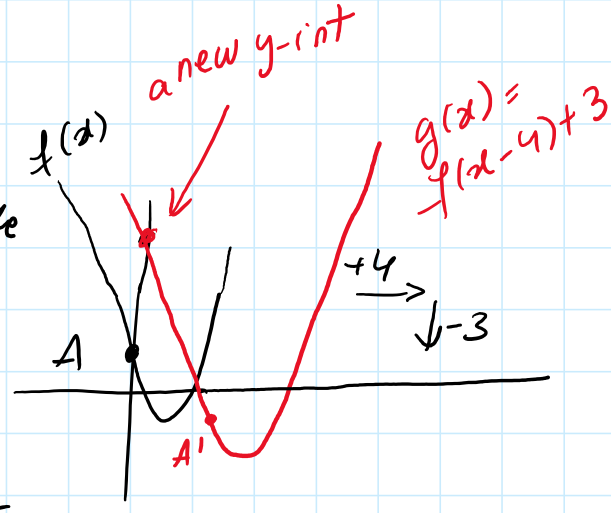
$(a,0) \to (2a, \cancel{0}) \to$ continues to be a y-int.

$(0,b) \to (\cancel{0}, 2b) \to$ continues to be a x-int

c) $y+3 = f(x-4)$

$g(x) = y = f(x-4) - 3$

For example




$(x,y) \to (x+4, y-3)$

A → A' but it doesn't mean that A' is a y-int now.

$(0,b) \to (0+4, b-3) = (4, b-3)$ not a y-int. b/c the x should be zero.

we would have to solve

$g(\emptyset) = ?$

but for that we must know what $g(x)$ is, and for that we must know what $f(x)$ is, but $f(x)$ is not given.

∴ The answer is unknown b/c $f(x)$ is unknown.

$(a,0) \to (a+4, \cancel{0}-3) = (a+4, -3)$

not an x-int, b/c the y is not zero.

b/c the y is not zero.

$\Rightarrow$ Same as before we need to solve for $x$: $g(x) = \emptyset$

$\therefore$ The answer is unknown b/c $f(x)$ is unknown, and thus $g(x)$ is unknown.

d) $y + 3 = \frac{1}{2} f\left(\frac{1}{4}(x-4)\right)$

$g(x) = y = \frac{1}{2} f\left(\frac{1}{4}(x-4)\right) - 3$

This is similar to the problem in point (c)

b/c we have shifts, not just stretches,

the zero in $(a, 0)$
and in $(0, b)$, will not be preserved.

These points move to new locations in

$g(x)$ but without those zeroes they are

no longer x-int and/or y-int. So instead

of using the transformation, we have to

calculate $g(\emptyset) = ?$

and solve $g(x) = 0$.

but neither $f(x)$ nor $g(x)$ are known.

$g(x)$ is based on $f(x)$

The answer is unknown.