

# Intro to Transformations - Worksheet

MCR3U

Jensen

SOLUTIONS

1) Describe the transformations, in order, that are being done to the function  $f(x)$ .

a)  $g(x) = -4f(x)$

- vertical reflection over the x-axis ( $-y$ )
- vertical stretch b.o.f.o 4 ( $4y$ )

b)  $g(x) = f(3x)$

- horizontal compression b.o.f.o  $\frac{1}{3}$  ( $\frac{x}{3}$ )

c)  $g(x) = \frac{1}{2}f(-x)$

- vertical compression b.o.f.o  $\frac{1}{2}$  ( $\frac{y}{2}$ )
- horizontal reflection over the y-axis ( $-x$ )

d)  $g(x) = -\frac{1}{3}f[\frac{1}{2}(x+1)]$

- vertical compression b.o.f.o  $\frac{1}{3}$  ( $\frac{y}{3}$ )
- vertical reflection over the x-axis ( $-y$ )
- horizontal stretch b.o.f.o 2 ( $2x$ )
- phase shift 1 unit left ( $x-1$ )

e)  $g(x) = 5f[-2(x-4)]$

- vertical stretch b.o.f.o 5 ( $5y$ )
- horizontal compression b.o.f.o  $\frac{1}{2}$  ( $\frac{x}{2}$ )
- horizontal reflection across the y-axis ( $-x$ )
- phase shift 4 units right ( $x+4$ )

f)  $g(x) = -2f(8x) + 4$

- vertical stretch b.o.f.o 2 ( $2y$ )
- vertical reflection over the x-axis ( $-y$ )
- horizontal compression b.o.f.o  $\frac{1}{8}$  ( $\frac{x}{8}$ )
- shift up 4 units ( $y+4$ )

h)  $g(x) = -\frac{1}{4}f[-3(x-1)] - 5$

- vertical compression b.o.f.o  $\frac{1}{4}$  ( $\frac{y}{4}$ )
- vertical reflection over x-axis ( $-y$ )
- horizontal compression b.o.f.o  $\frac{1}{3}$  ( $\frac{x}{3}$ )
- horizontal reflection over y-axis ( $-x$ )
- phase shift 1 unit right ( $x+1$ )
- shift 5 units down ( $y-5$ )

i)  $g(x) = 4f[-\frac{1}{2}(x+2)] - 1$

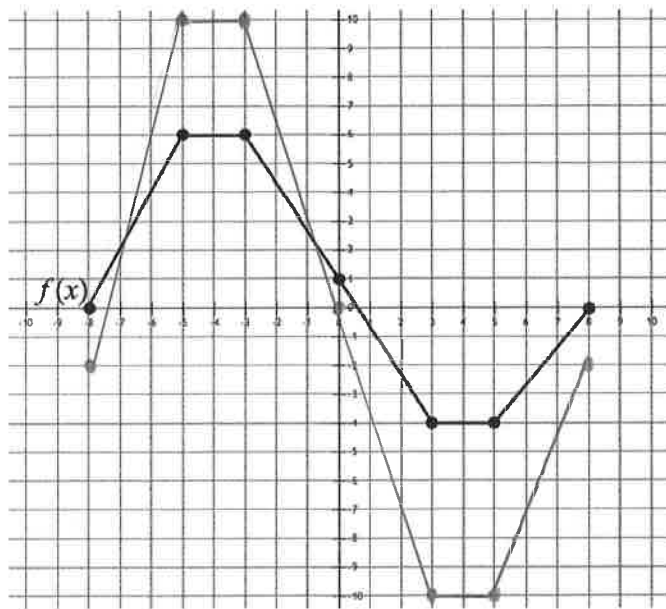
- vertical stretch b.o.f.o 4 ( $4y$ )
- horizontal stretch b.o.f.o 2 ( $2x$ )
- horizontal reflection over y-axis ( $-x$ )
- phase shift 2 units left ( $x-2$ )
- shift down 1 unit ( $y-1$ )

2) For the graph of  $f(x)$  given, sketch the graph of  $g(x)$  after the given transformation.

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

- vertical stretch base 2 ( $2y$ )
- shift down 2 units ( $y-2$ )

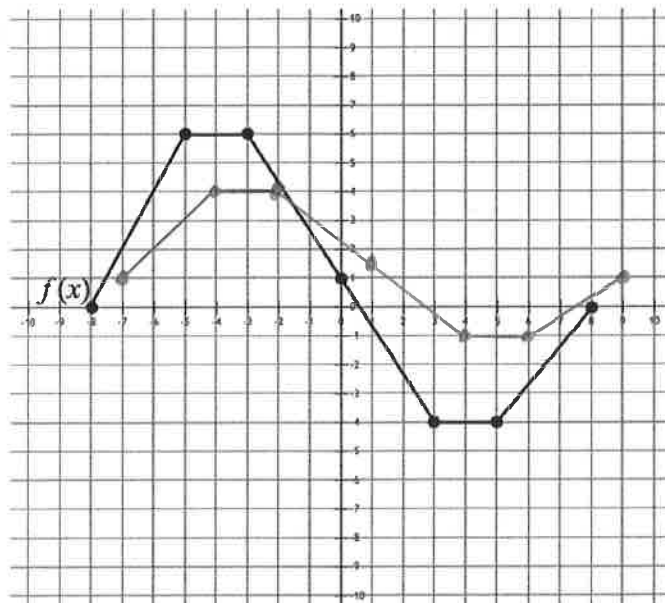
$(x, 2y-2)$



b)  $g(x) = \frac{1}{2}f(x-1)+1$

- vertical compression base  $\frac{1}{2}$  ( $\frac{y}{2}$ )
- phase shift right 1 unit ( $x+1$ )
- phase shift up 1 unit ( $y+1$ )

$(x+1, \frac{y}{2}+1)$



## Answers

1) a) vertical reflection over the x-axis and vertical stretch bafo 4 ( $-4y$ )

b) horizontal compression bafo  $\frac{1}{3}$  ( $\frac{x}{3}$ )

c) vertical compression bafo  $\frac{1}{2}$  ( $\frac{y}{2}$ ), horizontal relection over the y-axis ( $-x$ )

d) vertical reflection over the x-axis and vertical compression bafo  $\frac{1}{3}$  ( $\frac{y}{-3}$ ), horizontal stretch bafo 2 ( $2x$ ), phase shift left 1 unit ( $x - 1$ )

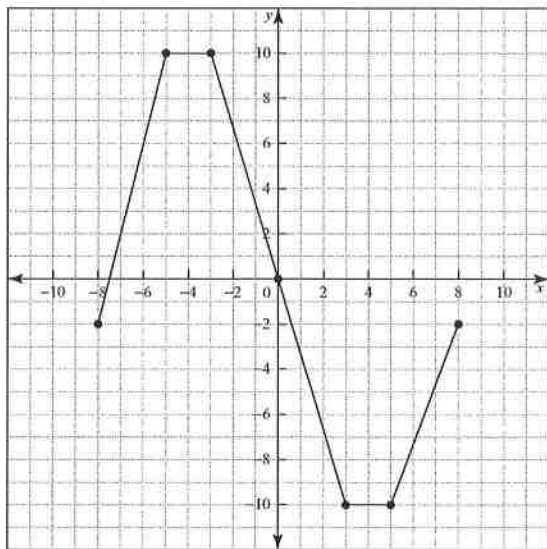
e) vertical stretch bafo 5 ( $5y$ ), horizontal reflection over the y-axis and horizontal compression bafo  $\frac{1}{2}$  ( $\frac{x}{-2}$ ), phase shift right 4 units ( $x + 4$ )

f) vertical reflection over the x-axis and vertical stretch bafo 2 ( $-2y$ ), horizontal compression bafo  $\frac{1}{8}$  ( $\frac{x}{8}$ ), shift up 4 units ( $y + 4$ )

h) vertical reflection over the x-axis and vertical compression bafo  $\frac{1}{4}$  ( $\frac{y}{-4}$ ), horizontal reflection over the y-axis and horizontal compression bafo  $\frac{1}{3}$  ( $\frac{x}{-3}$ ), phase shift right 1 unit ( $x + 1$ ), shift down 5 units ( $y - 5$ )

i) vertical stretch bafo 4 ( $4y$ ), horizontal reflection over the y-axis and horizontal stretch bafo 2 ( $-2x$ ), hase shift left 2 units ( $x - 2$ ), shift down 1 unit ( $y - 1$ )

2) a)



b)

