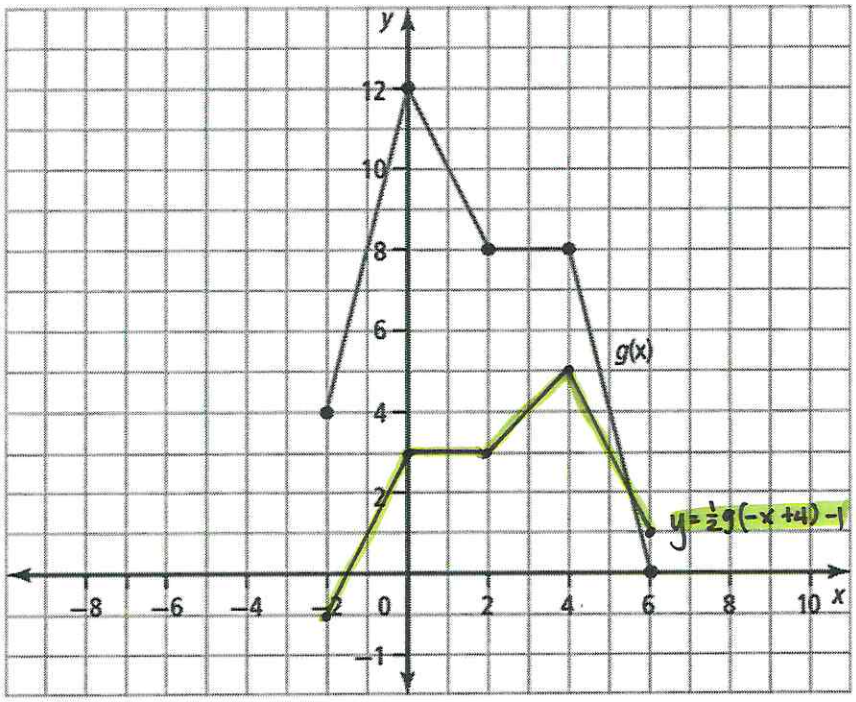
MPC40S Date: Answer key

OUTCOME R2 R3 R4 R5 – Review

1. Given the following graphs, perform each of the following transformations. Also answer the provided questions.

a) $y = \frac{1}{2}g(-x+4) - 1$

$y = \frac{1}{2}g(-(x-4)) - 1$



i) **Describe** the transformation in **words**.

↳ Vertical stretch by a factor of $\frac{1}{2}$

↳ Reflect over the y-axis

↳ Shift 4 units right

↳ Shift 1 unit down

ii) Provide the **mapping notation**

$(x, y) \to (-x+4, \frac{1}{2}y - 1)$

iii) **Domain** and **Range** of $g(x)$ and $y = \frac{1}{2}g(-x+4) - 1$

	$g(x)$	$y = \frac{1}{2}g(-x+4) - 1$
Domain	$[-2, 6]$	$[-2, 6]$
Range	$[0, 12]$	$[-1, 5]$

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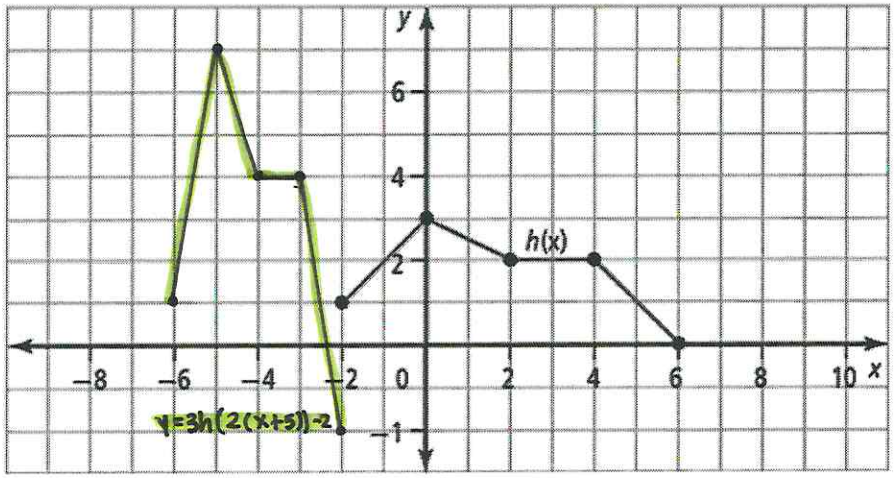
b) $y = 3h\big(2(x+5)\big) - 2$



i) **Describe** the transformation in **words**.

↳ Vertical stretch by a factor of 3

↳ Horizontal stretch by a factor of $\frac{1}{2}$

↳ Shift 5 units left

↳ Shift 2 units down

ii) Provide the **mapping notation**

$(x, y) \rightarrow \left(\frac{1}{2}x - 5, 3y - 2\right)$

iii) **Domain** and **Range** of $h(x)$ and $y = 3h\big(2(x+5)\big) - 2$

	$h(x)$	$y = 3h\big(2(x+5)\big) - 2$
Domain	$-2 \leq x \leq 6$	$-6 \leq x \leq -2$
Range	$0 \leq y \leq 3$	$-1 \leq y \leq 7$

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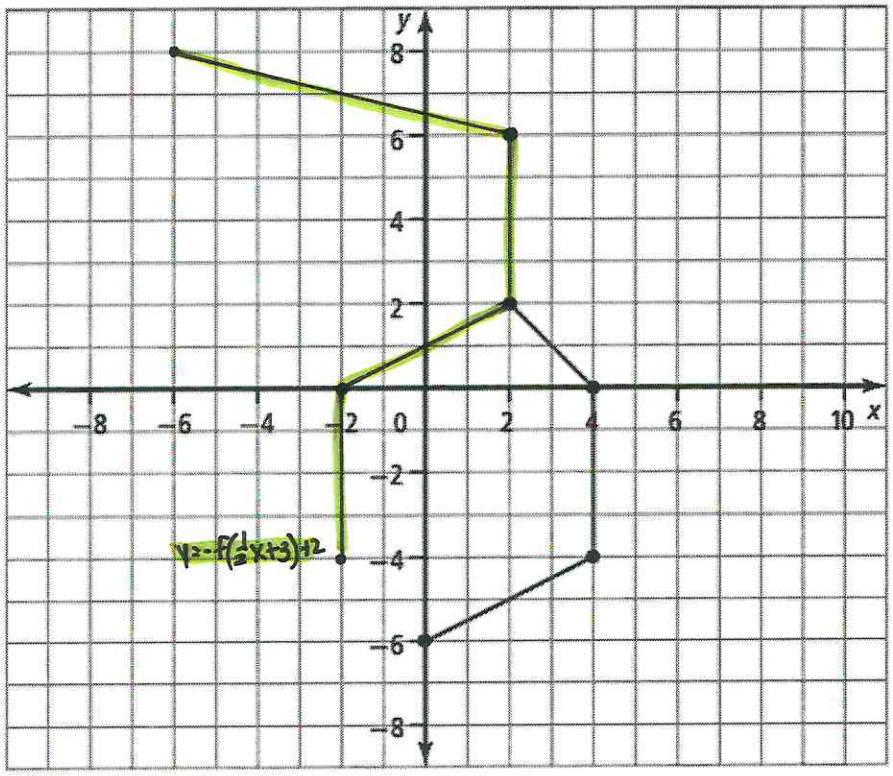
c) $y = -f\left(\frac{1}{2}x + 3\right) + 2$

$y = -f\left(\frac{1}{2}(x+6)\right) + 2$



i) **Describe** the transformation in **words**.

↳ Reflection over the x-axis
↳ Horizontal stretch by a factor of 2
↳ Shift 6 units left
↳ shift 2 units up

ii) Provide the **mapping notation**

$(x, y) \rightarrow (2x - 6, -y + 2)$

iii) **Domain** and **Range** of $g(x)$ and $y = -f\left(\frac{1}{2}x + 3\right) + 2$

	$f(x)$	$y = -f\left(\frac{1}{2}x + 3\right) + 2$
Domain	$[0, 4]$	$[-6, 2]$
Range	$[-6, 6]$	$[-4, 8]$

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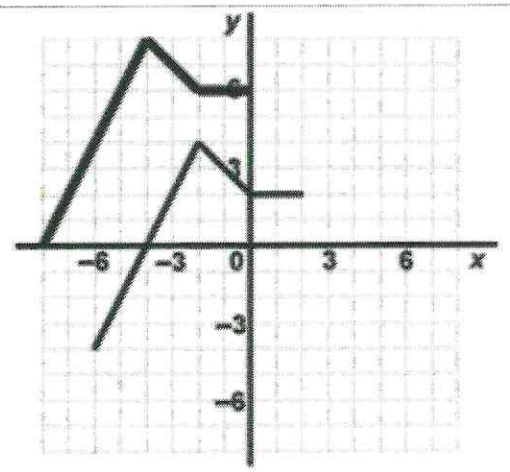
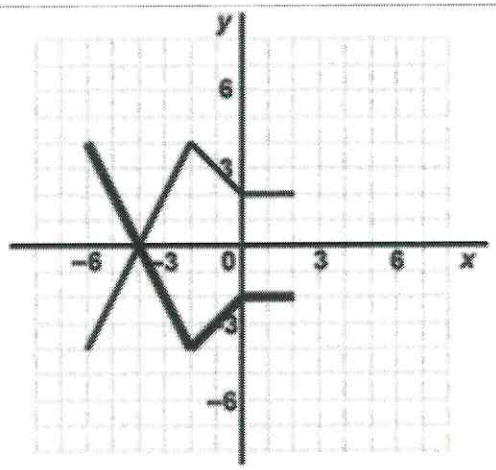
2. Write the **equation** for the **HEAVY** lined graph, given the lighter lined graph is $y = f(x)$.

a)



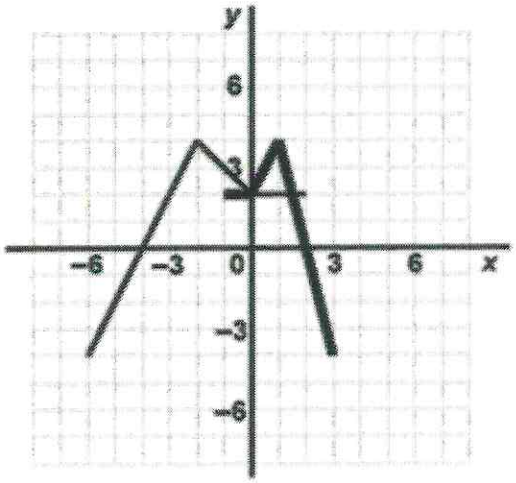
$y = f(x+2) + 4$

b)



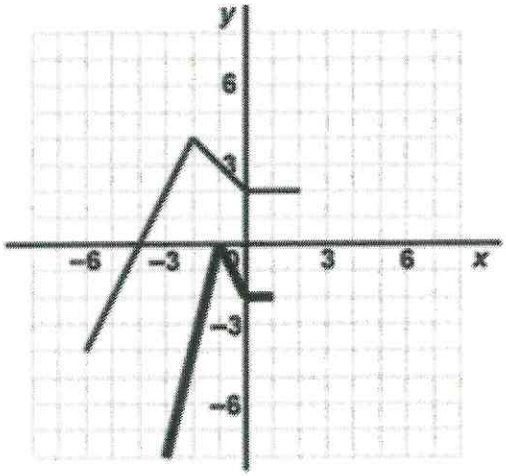
$y = -f(x)$

c)



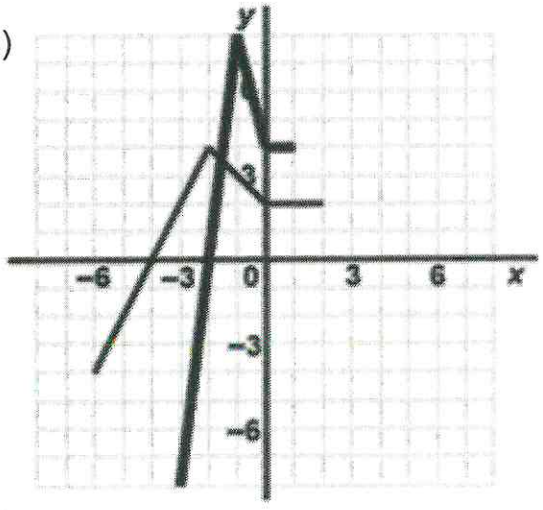
$y = f(-2x)$

d)



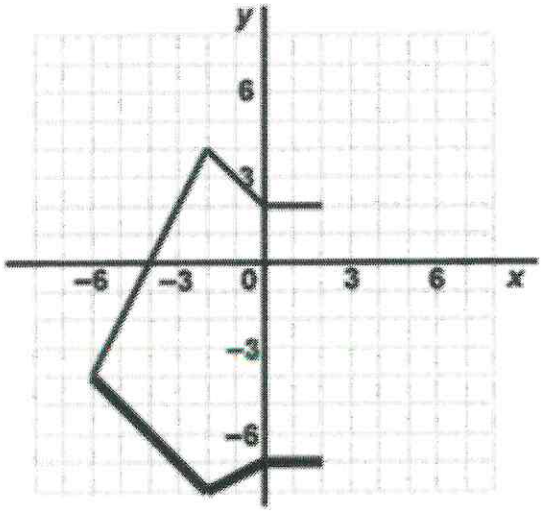
$y = f(2x) - 4$

e)



$y = 2f(2x)$

f)



$y = -\frac{1}{2}f(x) - 6$

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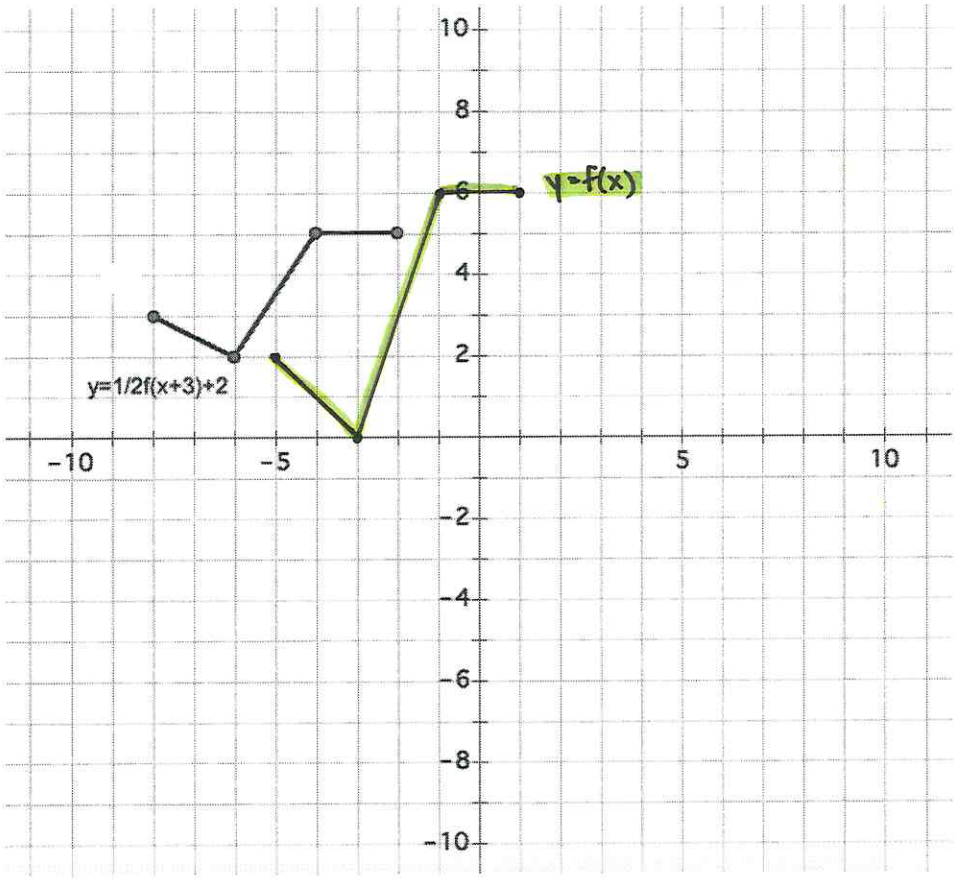
3. The graph of $y = \frac{1}{2}f(x+3)+2$ is given. Sketch the graph of $y = f(x)$.

$(x,y) \to (x-3, \frac{1}{2}y+2)$



4. **Describe**, in words, the following transformation applied to the graph of $y = f(x)$ if $y = 3f(-x+6)-1$.

$y = 3f(-(x-6))-1$

↳ Vertical stretch by a factor of 3
↳ Reflect over the y-axis
↳ Shift 6 units right
↳ Shift 1 unit down

5. The point $(1,6)$ lies on the graph of $y = -2f(x+4)+3$. What is the **original point** on the graph of $y = f(x)$?

$(x,y) \to (x-4, -2y+3)$

$1 = x-4$ $\quad 6 = -2y+3$

$5 = x$ $\quad 3 = -2y$

$-\frac{3}{2} = y$

$\therefore (1,6) \to (5, -3/2)$

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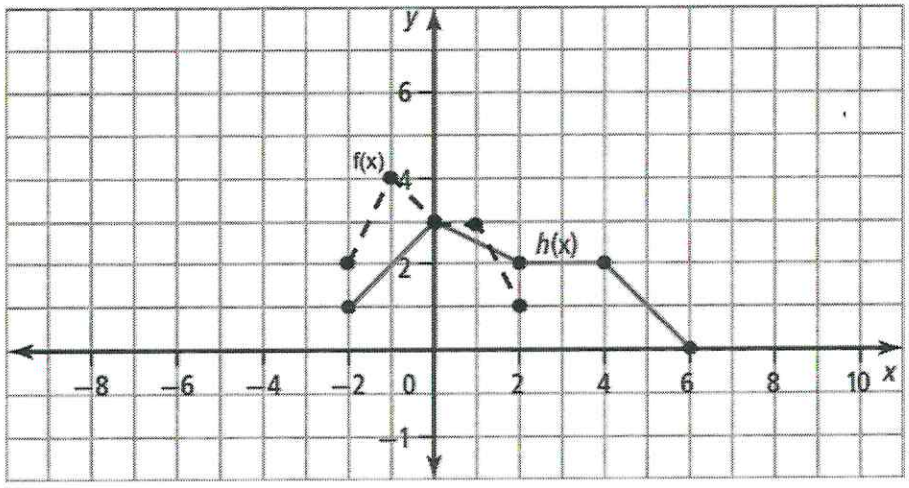
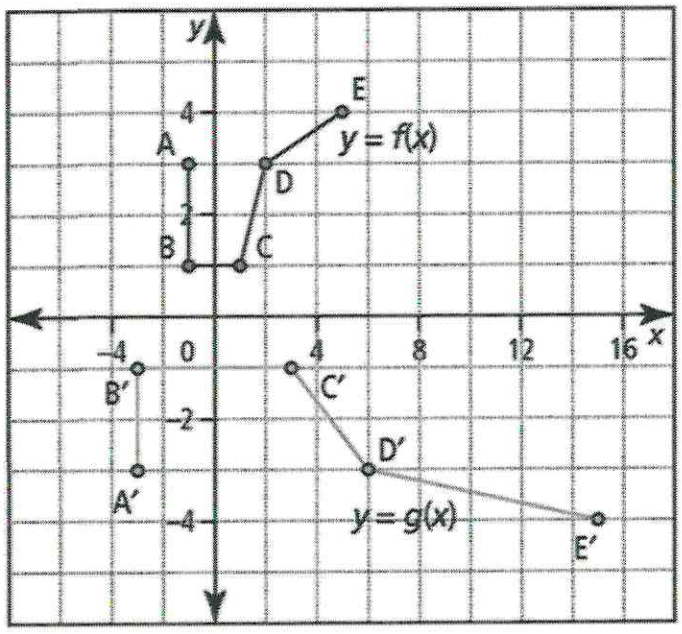
6. The graph of $h(x)$ represents a transformation of the graph of $f(x)$. Write the **equation** for the graph of $h(x)$ in terms of $f(x)$.



$h(x) = f\left(\frac{1}{2}(x-2)\right) - 1$

7. The graph of $g(x)$ represents a transformation of the graph of $f(x)$. Write the **equation** for the graph of $g(x)$ in terms of $f(x)$.



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

8. **Describe**, in words, the following transformations applied to the graph of $y = f(x)$ if $y = -f(2(x-1)) + 4$.

↳ Reflect over the x-axis
↳ Horizontal stretch by a factor of $\frac{1}{2}$
↳ Shift 1 unit right
↳ shift 4 units up

9. The domain of $y = f(x)$ is $-4 \leq x \leq 8$ and the range is $-6 \leq y \leq 12$. What are the **domain** and **range** of $g(x) = \frac{1}{3} f\left(\frac{1}{2}x\right)$?

$(x, y) \rightarrow (2x, \frac{1}{3}y)$

Domain : $-8 \leq x \leq 16$

Range : $-2 \leq y \leq 4$

10. The domain of $y = f(x)$ is $[-12, 18]$and the range is $[-3, 6]$. What are the **domain** and **range** of $g(x) = -2f(3x)$?

$(x, y) \rightarrow (\frac{1}{3}x, -2y)$

Domain : $[-4, 6]$

Range : $[-12, 6]$

11. Match the mapping with the correct transformation.

a) $(x, y) \rightarrow \left(\frac{1}{4}x, y\right)$
b) $(x, y) \rightarrow (x, y + 4)$
c) $(x, y) \rightarrow (x + 4, y)$
d) $(x, y) \rightarrow (x, 4y)$

A) vertical stretch by a factor of 4
B) horizontal stretch by a factor of $\frac{1}{4}$
C) vertical translation up 4 units
D) horizontal translation right 4 units

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12. Write the equation for each transformation of $y = f(x)$ in the form $y = af(b(x - h) + k$

a) a vertical stretch by a factor of 3, reflected in the y-axis, and translated 3 units left and 2 units down

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

b) a horizontal stretch by a factor of 2, reflected in the x-axis, and translated 7 units up

$y = -f(\frac{1}{2}x) + 7$

c) a horizontal stretch by a factor of $\frac{1}{4}$ translated 5 units right and 1 unit down

$y = f(4(x-5)) - 1$

d) a vertical stretch by a factor of $\frac{1}{3}$ a horizontal stretch by a factor of $\frac{1}{2}$ and reflected in the x-axis

$y = -\frac{1}{3}f(2x)$

13. The point $(-18, 12)$ is on the graph of $y = f(x)$. What is the **image point** under each transformation of the graph of $f(x)$?

a) $y = f(x - 6) - 8$

$(x, y) \to (x+6, y-8)$ $(-18, 12) \to (-12, 4)$

b) $y = 2f(6x)$

$(x, y) \to (\frac{1}{6}x, 2y)$ $(-18, 12) \to (-3, 24)$

c) $y = -3f(x + 5) + 4$

$(x, y) \to (x-5, -3y+4)$ $(-18, 12) \to (-23, -32)$

d) $y = \frac{1}{2}(-3x + 6) - 1$

$y = \frac{1}{2}f(-3(x-2)) - 1$

$(x, y) \to (-\frac{1}{3}x + 2, \frac{1}{2}y - 1)$ $(-18, 12) \to (8, 5)$