

1. Explain what transformations you would need to apply to the graph of $y = f(x)$ to graph each function.

a. $y = 3f(x) - 1$

c. $y = f(2x) - 5$

e. $y = \frac{2}{3}f(x + 3) + 1$

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

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

f. $y = 4f(-x) - 4$

2. Sketch each set of functions on the same set of axes.

a. $y = x^2, y = 3x^2, y = 3(x - 2)^2$

c. $y = \frac{1}{x}, y = \frac{2}{x}, y = -\frac{2}{x}, y = -\frac{2}{x-1} + 3$

b. $y = \sqrt{x}, y = \sqrt{3x}, y = \sqrt{-3x},$
 $y = \sqrt{-3(x + 1)} - 4$

d. $y = |x|, y = \left|\frac{1}{2}x\right|, y = -\left|\frac{1}{2}x\right|,$
 $y = -\left|\frac{1}{2}(x + 3)\right| - 2$

3. Explain what transformations you would need to apply to the graph of $y = f(x)$ to graph each function.

a. $y = f\left(\frac{1}{3}(x + 4)\right)$

c. $y = -3f(2(x - 1)) - 3$

b. $y = 2f(-(x - 3))$

4. If $f(x) = x^2$, sketch the graph of each function and state the domain and range.

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

c. $y = 0.5f(3(x - 4)) - 1$

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

5. If $f(x) = \sqrt{x}$, sketch the graph of each function and state the domain and range.

a. $y = f(x - 1) + 4$

c. $y = -2f(-(x - 2)) + 1$

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

6. If $f(x) = |x|$, sketch the graph of each function and state the domain and range.

a. $y = f(2(x - 3))$

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

b. $y = 4f(2(x - 1)) - 2$

7. Describe the transformations that you would apply to the graph of $f(x) = \frac{1}{x}$ to transform it into each of these graphs. Is there more than one possible answers for some of these?

a. $y = \frac{1}{x - 2}$

d. $y = \frac{2}{x}$

b. $y = \frac{1}{x} + 2$

e. $y = \frac{1}{2x}$

c. $y = 0.5\left(\frac{1}{x}\right)$

f. $y = -\frac{1}{x}$

8. For $f(x) = x^2$, sketch the graph of $g(x) = f(2x + 6)$.

9. For $f(x) = \sqrt{x}$, sketch the graph of $g(x) = f(-3x - 12)$.

10. For $f(x) = |x|$, sketch the graph of $g(x) = f(4x + 8)$.

11. The graph of $g(x) = \sqrt{x}$ is reflected across the y-axis, stretched vertically by the factor of 3, and then translated 5 units right and 2 units down. Draw the graph of the new function and write its equation.

12. Match each equation to its graph. Explain your reasoning (do not test individual points).c

a. $y = \frac{3}{-(x-2)} + 1$

b. $f(x) = 2|x-3| - 2$

c. $f(x) = -2\sqrt{x+3} - 2$

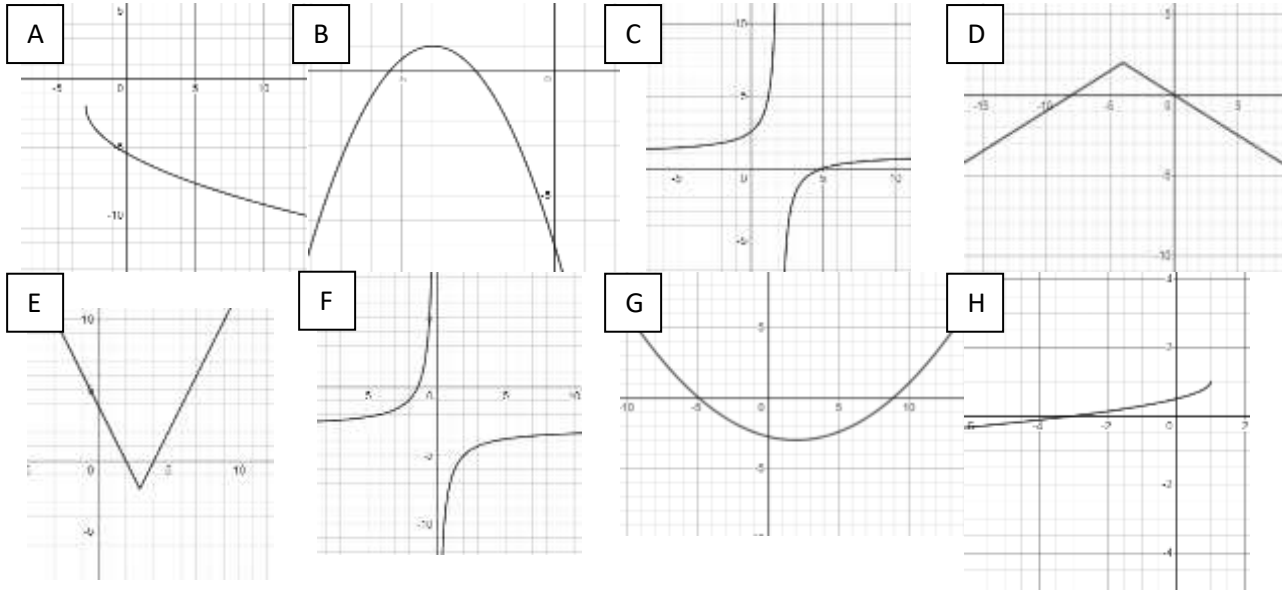
d. $f(x) = (0.25(x-2))^2 - 3$

e. $y = -\frac{4}{x} - 3$

f. $f(x) = -0.5|x+4| + 2$

g. $f(x) = -0.5\sqrt{1-x} + 1$

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



13. The function $y = f(x)$ has been transformed to $y = af[k(x-d)] + c$. Determine a , k , c and d ; sketch the graph; and state the domain and range for each.

- A vertical stretch by a factor of 2, a reflection in the x -axis, and a translation 4 units right are applied to $y = \sqrt{x}$
- A vertical compression by the factor $\frac{1}{2}$, a reflection in the y -axis, a translation 3 units left, and a translation 6 units down are applied to $f(x) = \frac{1}{x}$.
- A horizontal compression by a factor of 3, a vertical stretch by the factor 3, a translation 1 unit right, and a translation 6 units down are applied to $y = |x|$.

14. If $f(x) = (x-2)(x+5)$, determine the x -intercepts for each function **without** graphing. Explain your thinking.

a. $y = f(x)$

b. $y = -4f(x)$

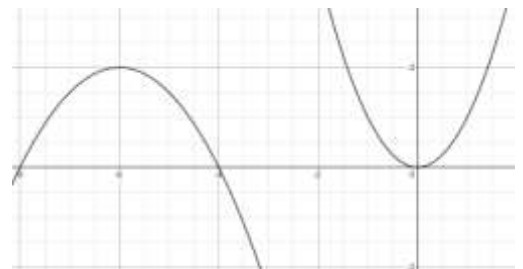
c. $y = f\left(-\frac{1}{3}x\right)$

d. $y = f(-(x+2))$

15. List the steps you would take to sketch the graph of a function of the form $y = af(k(x-d)) + c$ when $f(x)$ is one of the parent functions you have studied in this chapter. Discuss the roles of a , k , c , and d and the order in which they are applied.

16. The graphs of $f(x) = x^2$ and another parabola, $g(x)$, are shown.

- Determine a combination of transformations that would produce the second parabola from the first.
- Determine the equation of the second parabola.



Answers:

Note: let **ref x**= reflection over the x-axis, **ref y**= reflections over the y-axis, **vs** = vertical stretch by a factor of, **vc**=vertical compression by a factor of, **hs**=horizontal stretch by a factor of, **hc**=horizontal compression by a factor of, **vt**= vertical translation, and **ht**= horizontal translation

1.	a.	vs 3, vt down 1	c.	hc 2, vt down 5	e.	vc 3/2, ht left 3, vt up 1
	b.	ht right 2, vt up 3	d.	ref x, hs 2, vt down 2	f.	ref y, vs 4, vt down 4

2. 4, 5, 6, 8, 9, 10, 11, 13 Check your solutions on Desmos

3.	a.	hc 3, ht left 4	b.	ref y, vs 2, ht right 3	c.	ref x, vs 3, hc 2, ht right 1, vt down 3
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4. Check your graphs on Desmos

a.	D: $\{x \in R\}$ R: $\{y \geq 3, y \in R\}$	b.	D: $\{x \in R\}$ R: $\{y \leq 2, y \in R\}$	c.	D: $\{x \in R\}$ R: $\{y \geq -1, y \in R\}$
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5. Check your graphs on Desmos

a.	D: $\{x \geq 1, x \in R\}$ R: $\{y \geq 4, y \in R\}$	b.	D: $\{x \leq -4, x \in R\}$ R: $\{y \geq -3, y \in R\}$	c.	D: $\{x \leq 2, x \in R\}$ R: $\{y \leq 1, y \in R\}$
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6. Check your graphs on Desmos

a.	D: $\{x \geq 1, x \in R\}$ R: $\{y \geq 4, y \in R\}$	b.	D: $\{x \leq -4, x \in R\}$ R: $\{y \geq -3, y \in R\}$	c.	D: $\{x \leq 2, x \in R\}$ R: $\{y \leq 1, y \in R\}$
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7.

a.	ht right 2, no other possible option	c.	vc 2... or hc 2	e.	hc 2or.... vc 2
b.	Vt up 2, no other possible option	d.	vs 2....or hs 2	f.	ref xor....ref y

11. $y = 3\sqrt{-(x-5)} - 2$ or it can be written in function notation as: $g(x) = 3f(-(x-5)) - 2$.

12.

a.	C	c.	A	e.	F	g.	H
b.	E	d.	G	f.	D	h.	B

13.

a.	a: -2 k: NA c: NA d: 4 D: $\{x \geq 4, x \in R\}$ R: $\{y \leq 0, y \in R\}$	b.	a: 0.5 k: -1 c: -6 d: -3 D: $\{x \neq -3, x \in R\}$ R: $\{y \neq -6, y \in R\}$	c.	a: 3 k: 3 c: -6 d: 1 D: $\{x \in R\}$ R: $\{y \geq -6, y \in R\}$
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14.

a.	-5, 2	b.	-5, 2	c.	-6, 15	d.	-4, 3
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15. See your notes :)

16. a) ref x, vc 2, ht left 6, vt up 2

b) $g(x) = -\frac{1}{2}f(x+6) + 2$ or $g(x) = -\frac{1}{2}(x+6)^2 + 2$