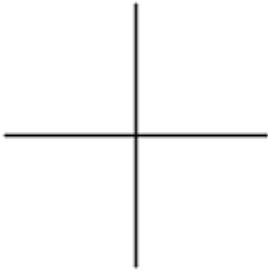# Multi-Section Graphing Packet
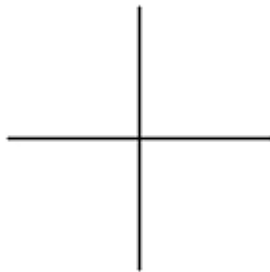
Section I – Parent Graphs
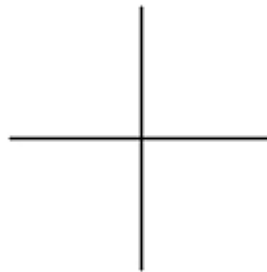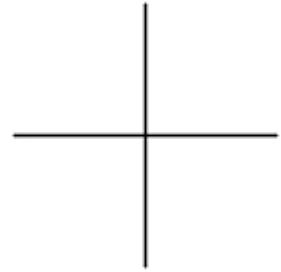**Graph each function and clearly indicate units on the axes provided.**
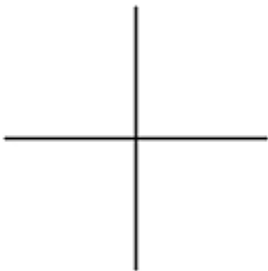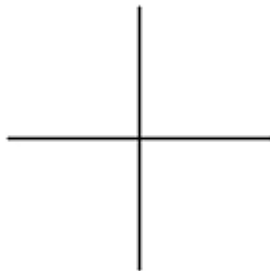
1. $f(x) = x$
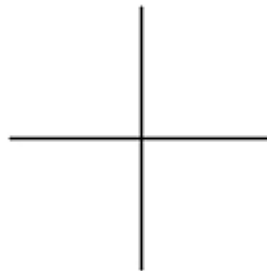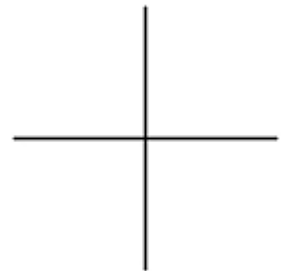
2. $f(x) = x^2$

3. $f(x) = x^3$
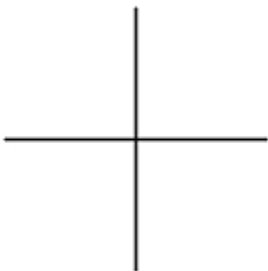
4. $f(x) = |x|$

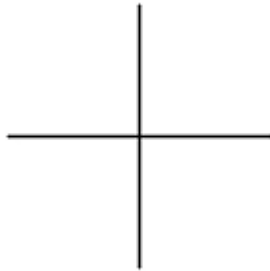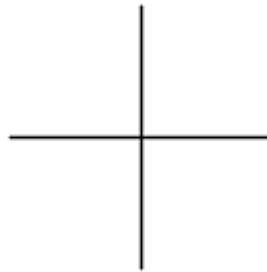5. $f(x) = \sin x$

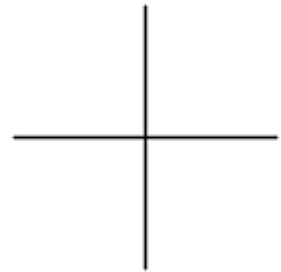6. $f(x) = \cos x$

7. $f(x) = \tan x$
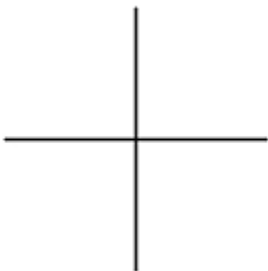
8. $f(x) = \sec x$

9. $f(x) = 2^x$
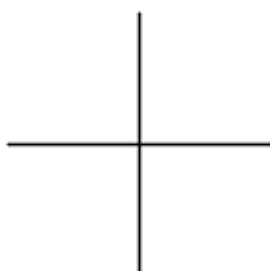
10. $f(x) = \log_2 x$

11. $f(x) = \dfrac{1}{x}$
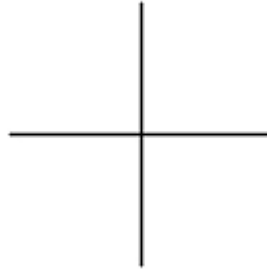
12. $f(x) = \dfrac{1}{x^2}$

13. $f(x) = \sqrt{x}$

14. $f(x) = \sqrt{a^2 - x^2}$, where a is a constant.

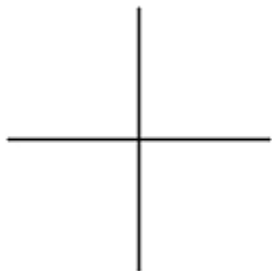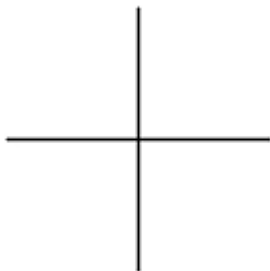15. $f(x) = [x]$ (Greatest integer "step" function)

Section II – Reflections across $y = x$.
Reflect the given functions across the line $y = x$. **Indicate which of the reflections are functions.**
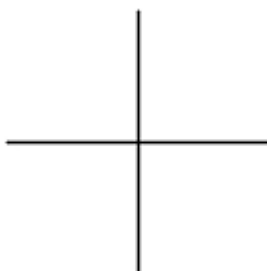
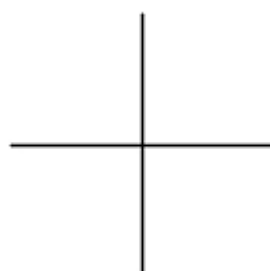16. $f(x) = |x|$ 17. $f(x) = \sin x$ 18. $f(x) = 2^x$ 19. $f(x) = \sqrt{x}$
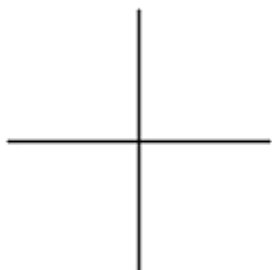
20. Is there a characteristic of a function that assures that its reflection across the line $y = x$ is a function?
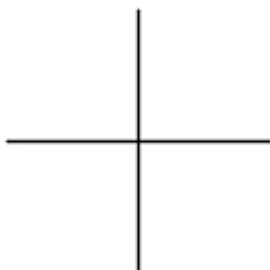
Section III – Graphical Transformations
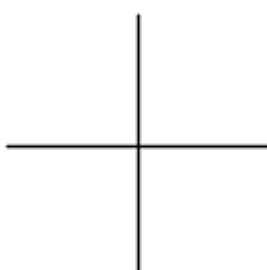**Graph each function (by hand) using transformations from the parent graph.**
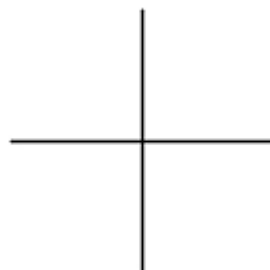
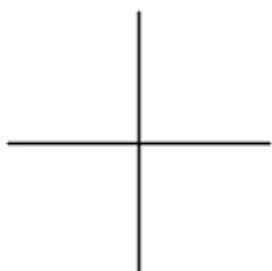21 a. $f(x) = 2x + 1$ b. $g(x) = f(-x)$ 22 a. $f(x) = \sqrt{x}$ b. $g(x) = -f(x)$
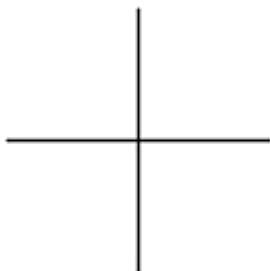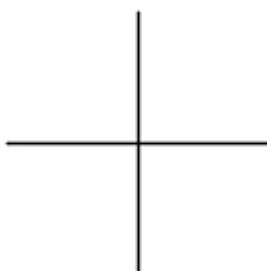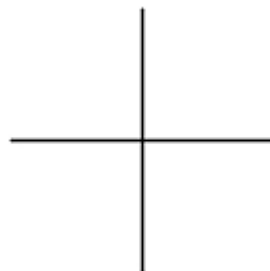
23 a. $f(x) = 2^x$ b. $g(x) = f(x) + 1$ 24 a. $f(x) = x^2$ b. $g(x) = f(x-2)$

Generalize what is happening geometrically when using the function $f(x)$ to obtain the graph of

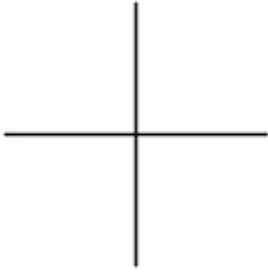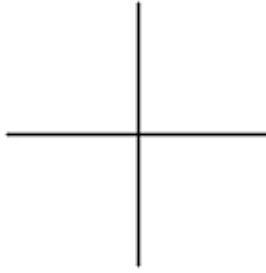a) $f(-x)$ _____

b) $-f(x)$ _____

c) $f(x) + c$ _____

d) $f(x-c)$ _____
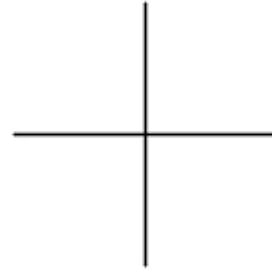
Multi-Section Graphing Packet

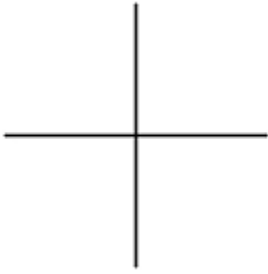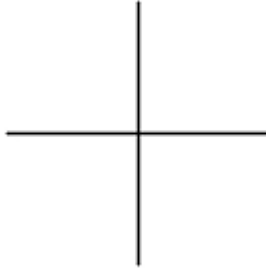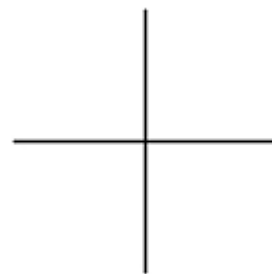25 a. $f(x) = \sin x$ b. $g(x) = 2f(x)$ c. $h(x) = f(2x)$

26 a. $f(x) = |x|$ b. $g(x) = \dfrac{1}{3}f(x)$ c. $h(x) = f\left(\dfrac{x}{3}\right)$
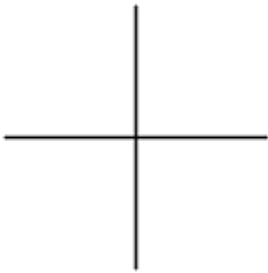
Generalize what geometric transformation takes place when using $f(x)$ to obtain the graph of
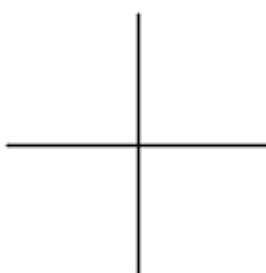
a) $c \cdot f(x)$ _____

b) $f(cx)$ _____

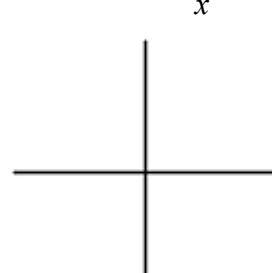Use the generalizations to sketch the graphs of the following functions.
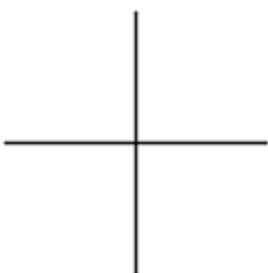
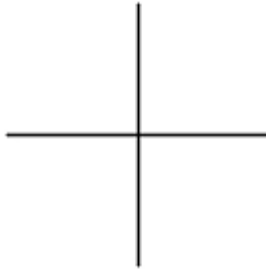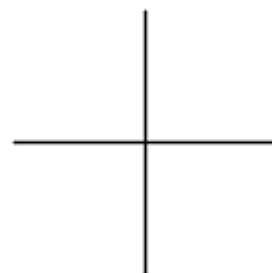27. $f(x) = -\sec x$ 28. $f(x) = (x+1)^3$ 29. $f(x) = 1 + \dfrac{1}{x^2}$

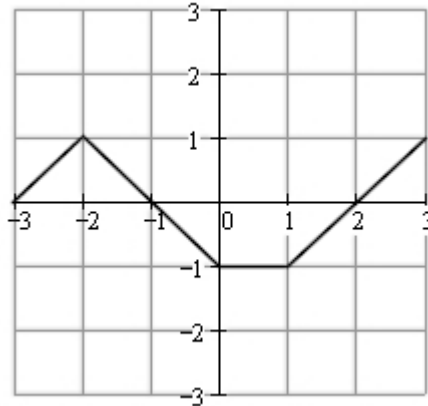30. $f(x) = \tan\left(x - \dfrac{\pi}{4}\right)$ 31. $f(x) = \dfrac{-2}{x-3}$ 32. $f(x) = \log_2(1-x)$
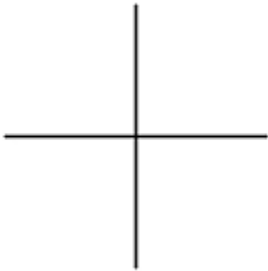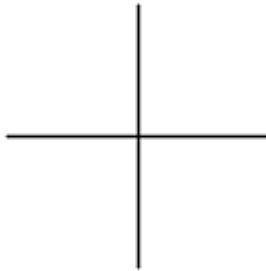
Multi-Section Graphing Packet

Given the graph of $f(x)$ as shown below over the domain $-3 \le x \le 3$, graph the following transformations and indicate units on the axes.
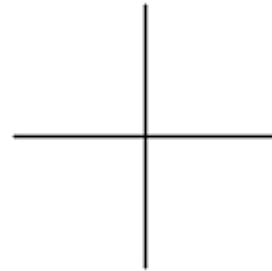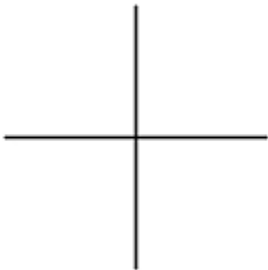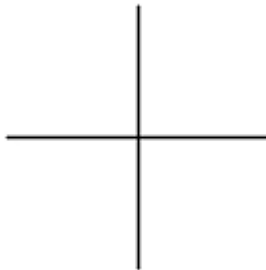

33. $f_1(x) = f(-x)$

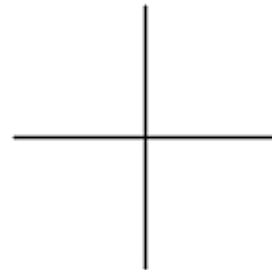34. $f_2(x) = -f(x)$

35. $f_3(x) = f(x) - 1$

36. $f_4(x) = f(x-1)$

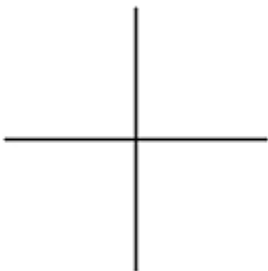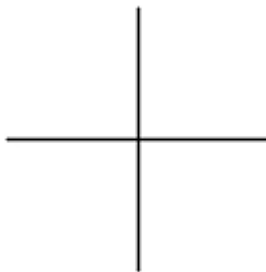37. $f_5(x) = f(2x)$

38. $f_6(x) = 1 - f(x)$

39. $f_7(x) = f(2-x)$
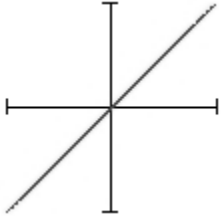
40. $f_8(x) = \dfrac{1}{2} f\left(\dfrac{x}{2}\right)$

Section IV- Graphical Interpretation of Absolute Value
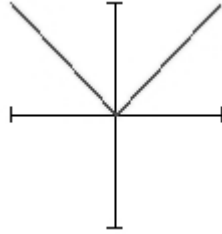**The inclusion of absolute value in the description of a function can bring about dramatic changes.**
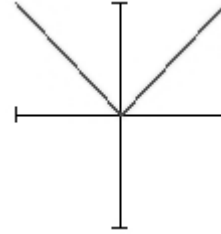**Note the following examples**.

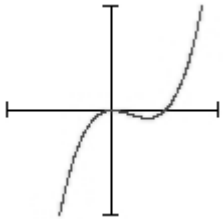A. $f(x) = x$ $f(|x|) = |x|$ $|f(x)| = |x|$
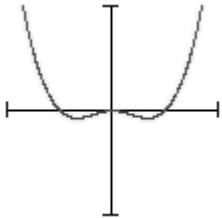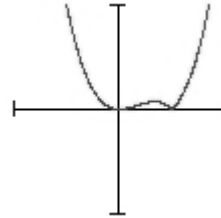
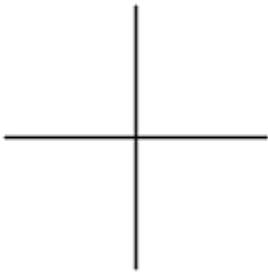B. $f(x) = x^3 - x^2$ $f(|x|) = (|x|)^3 - (|x|)^2$ $|f(x)| = |x^3 - x^2|$
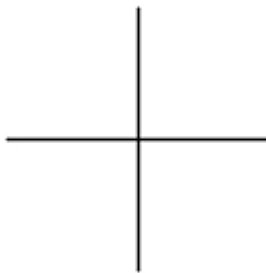
Sketch each $f(x)$ and subsequent transformations affected by absolute value. In addition, write the formula for each function.
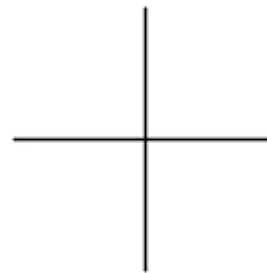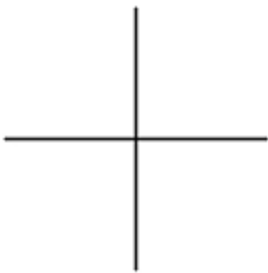
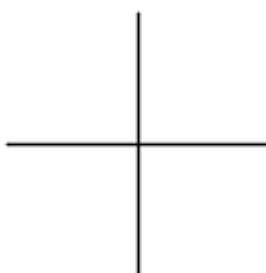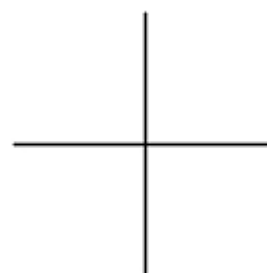41 a. $f(x) = x^2 + x$ b. $f(|x|) =$ _____   c. $|f(x)| =$ _____

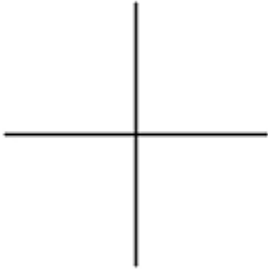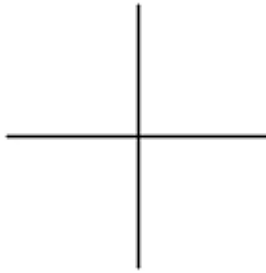42 a. $f(x) = \sin x$ b. $f(|x|) =$ _____   c. $|f(x)| =$ _____
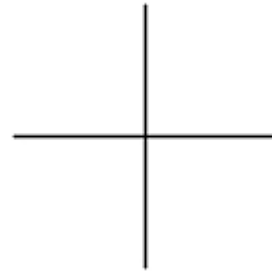
Multi-Section Graphing Packet

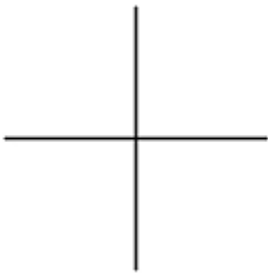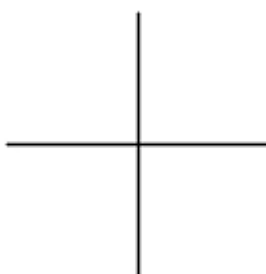43 a. $f(x) = e^x$ b. $f(|x|) =$ _____   c. $|f(x)| =$ _____
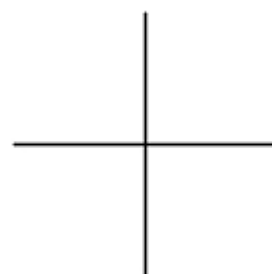
44 a. $f(x) = \ln x$ b. $f(|x|) =$ _____   c. $|f(x)| =$ _____

Describe the geometric transformation on $f(x)$ involved in graphing, as well as how to graph it.

a) $f(|x|)$ _____

b) $|f(x)|$ _____

45. Graph $f(x) = |\ln(|x|)|$