

Transformations —

Start with $f(x)$

1. Up c units up $f(x) + c$

2. Down c units $f(x) - c$

3. Right c units $f(x - c)$

4. Left c units $f(x + c)$

5. Reflect across x axis $-f(x)$

6. Reflect across y axis $f(-x)$

$$\text{If } f(x) = x^2 \\ f(x) + 5 = x^2 + 5$$

7. Vertical Stretch

$$cf(x), c > 1$$

8. Vertical Shrink

$$cf(x), 0 < c < 1$$

9. Horizontal Stretch

$$f(cx), 0 < c < 1$$

10. Horizontal Shrink

$$f(cx), c > 1$$

$$f(x) = 5 - 2(x-3)^2$$

$$= \underbrace{-}_{\text{Ref } x \text{ axis}} \underbrace{2}_{\text{V. STRETCH}} \underbrace{(x-3)^2}_{\text{RIGHT 3}} \underbrace{+ 5}_{\text{Up 5}}$$

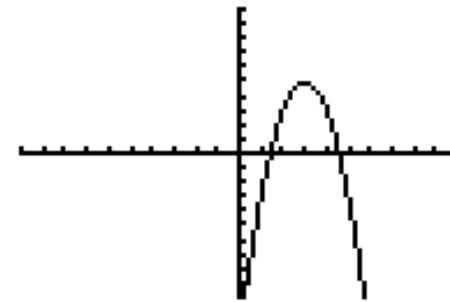
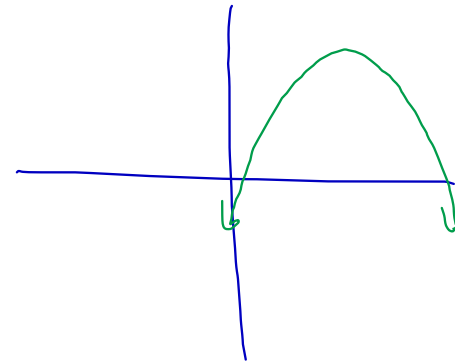
Up 5

Right 3

V. STRETCH

Ref across x axis

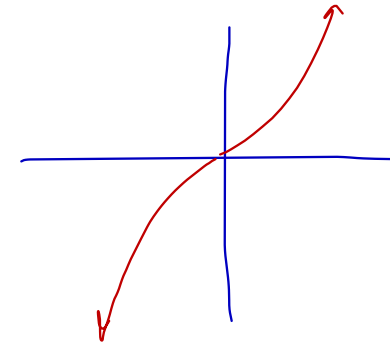
$$g(x) = x^2$$



$$f(x) = -3 - 7 \left[-4(x+5) \right]^3$$

$$g(x) = x^3$$

$$f(x) = -7 \left[-4(x+5) \right]^3 - 3$$



Ref
x axis
-f(x)

V. SH
cf(x)

L. 5
f(x+c)

D. 3
f(x)-c

Ref
y axis
f(-x)

H. SH.
f(cx)

✓ 1. Ref across y axis $f(-x)$ $g(x) = \sqrt[4]{x}$

2. Vert Shrink $(\frac{1}{3})$ $\frac{1}{3} f(x)$

✓ 3. Horz stretch $(\frac{1}{2})$ $f(\frac{1}{2}x)$

✓ 4. Right 4 $f(x-c)$

$$f(x) = \frac{1}{3} \sqrt[4]{\left[-\frac{1}{2}(x-4)\right]}$$

#w. pg 98

15 - 29 odd

31 - 38