Topic: **Transformations of graphs**

What is it? Shifting, stretching, shrinking, and reflecting of graphs

Types:

Vertical or Horizontal shift	Reflection	Vertical Stretch or Shrink

Examples

Vertical or Horizontal shift

- **Add outside** $y = 2^x + 3$
  MOVES UP
- **Subtract outside** $y = 2^x - 3$
  MOVES DOWN
- **Add inside** $y = 2^{(x+3)}$
  MOVES Left
- **Subtract inside** $y = 2^{(x-3)}$
  MOVES Right

Reflection

- **Multiply by a negative (–)** $y = -2^x$
  Causes the graph to Flip
  Exp: *Reflection over the asymptote*
  Linear: *Reflection over the x-axis*

Vertical Stretch or Shrink

- **Multiply by a fraction (less than 1)** $y = \frac{1}{4}(2)^x$
  Causes the graph to Shrink
- **Multiply by an integer** $y = 4(2)^x$
  Causes the graph to Stretch

WIDE

TALL

1) $f(x) = 2|x| + 4$

Parent function $f(x) = x$
- stretch
- up 4

2) $f(x) = 2^x - 6$

Parent function $f(x) = 2^x$
- Down 6

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

Parent function $f(x) = 2^x$
- Flip / Reflect
- Shrink

4) $f(x) = 3^{x+2}$

Parent function $f(x) = 3^x$
- left 2

5) $f(x) = 5(3)^{x-4} + 2$

Parent function $f(x) = 3^x$
- stretch
- right 4
- up 2

6) $f(x) = -\frac{1}{2}(4)^{x+1} - 7$

Parent function $f(x) = 4^x$
- Flip / Reflect
- Shrink
- left 1
- down 7