Transformations

Vertical Transformations

- $f(x) + c$: Shift up by c.
- $f(x) - c$: Shift down by c.
- $a \cdot f(x)$: Vertical stretch/contraction by a.
- $-f(x)$: Reflection over the x axis.

Horizontal Transformations

- $f(x + c)$: Shift left by c.
- $f(x - c)$: Shift right by c.
- $f(a \cdot x)$: Vertical stretch/contraction by a.
- $f(-x)$: Reflection over the y axis.

Write the formula for the following transformations:

1. $y = \sqrt[4]{x}$ shifted to the right 4 and up 6.

2. $y = \pi^x$ reflected over the x axis, compressed vertically by a factor of 3, and shifted down 2 and to the right 4.

3. $y = x^\pi$ reflected over the y axis, compressed horizontally by a factor of 3, and shifted to the left 6.

4. $y = \frac{\sqrt{x^3-1}}{1+\sqrt[3]{x}}$ stretched horizontally by a factor of 2 and shifted to the left 1.

Compositions

Break the following into a composition of functions:

1. $\sqrt[3]{1+4x}$
2. $tan\pi x$
3. $sin(tan2x)$
4. $\frac{1}{\sqrt[3]{x^2+x+1}}$
5. $sin(sin(sin(x)))$
6. $\sqrt{x+\sqrt{x+\sqrt{x}}}$
7. $[x+(x+sin^2x)^3]^4$
8. $cos\sqrt{sin(tan\pi x)}$

Trigonometric Functions

Draw the 30-60-90 triangle below:

Evaluate the following:

1. $sin(\frac{\pi}{3})$
2. $sin(\frac{\pi}{6})$
3. $cos(\frac{\pi}{3})$
4. $cos(\frac{\pi}{6})$
5. $tan(\frac{\pi}{3})$
6. $tan(\frac{\pi}{6})$

Draw the 45-45-90 triangle below:

Evaluate the following:

1. $sin(\frac{\pi}{4})$
2. $cos(\frac{\pi}{4})$
3. $tan(\frac{\pi}{4})$

Important Trig Identities

- $-1 \leq sinx \leq 1$
- $-1 \leq cosx \leq 1$
- $tanx = \frac{sinx}{cosx}$
- $secx = \frac{1}{cosx}$
- $cosx = \frac{1}{sinx}$
- $cotx = \frac{1}{tanx}$
- $sin^2x + cos^2x = 1$
- $1 + tan^2x = sec^2x$
- $1 + cot^2x = csc^2x$
- $sin(-x) = -sinx$
- $cos(-x) = cosx$
- $sin(2x) = 2sinxcosx$
- $cos(2x) = cos^2x - sin^2x$

Can you get $1 + tan^2x = sec^2x$ and $1 + cot^2x = csc^2x$ from $sin^2x + cos^2x = 1$?

Can we think of $sin(-x) = -sinx$ and $cos(-x) = cosx$ in terms of transformations? [Hint: Think of the graph of $sinx$ and $cosx$.]