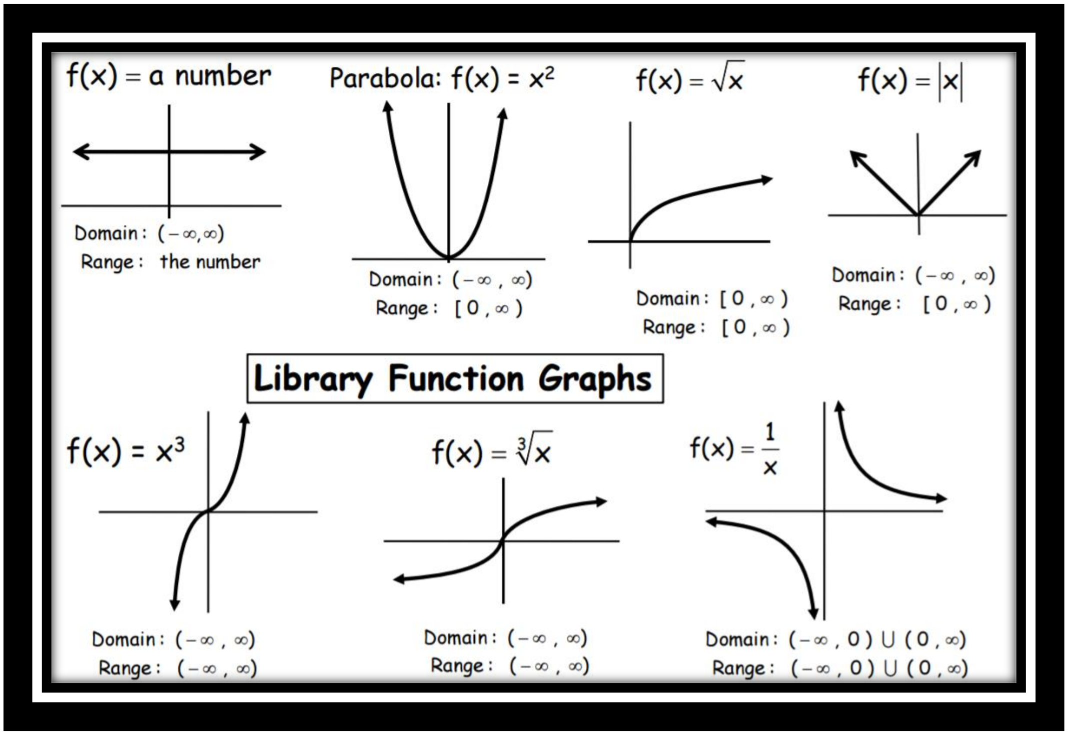
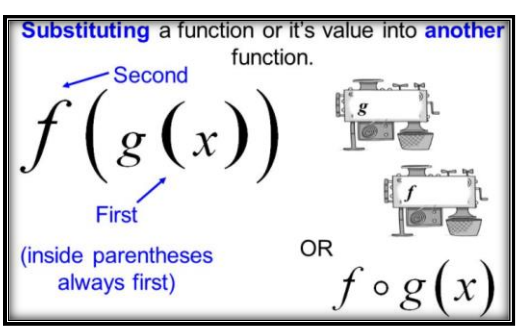
Transformations of Functions:



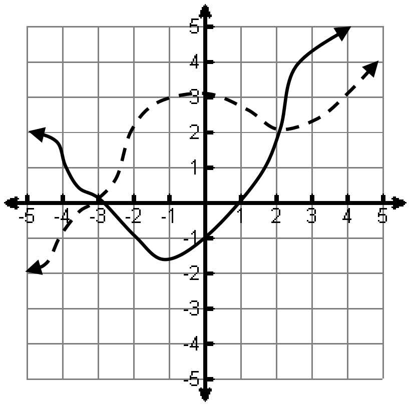
Transformation	Function	Description
Horizontal Shift	f(x + *h*)	Shift left *h* units
	f(x - *h*)	Shift right *h* units
Vertical Shift	f(x) + *k*	Shift up *k* units
	f(x) - *k*	Shift down *k* units
Reflection	−f(x)	Reflect across x-axis
	f(−x)	Reflect across y-axis
Vertical Stretch/Compress	*a* f(x), *a* > 1	Stretch vertically by a factor of *a*
	a f(x), 0 < *a* < 1	Compress vertically by a factor of *a*
Horizontal Stretch/Compress	f(*a*x), *a* > 1	Compress horizontally by a factor of $\frac{1}{a}$
	f(*a*x), 0 < *a* < 1	Stretch horizontally by a factor of $\frac{1}{a}$

Compositions of Functions:

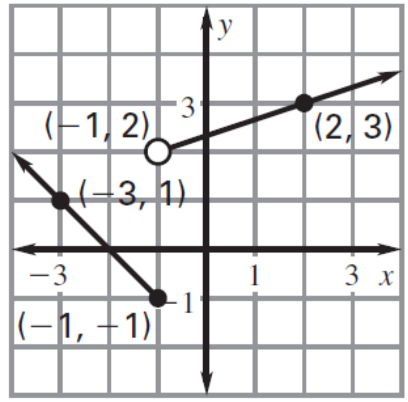


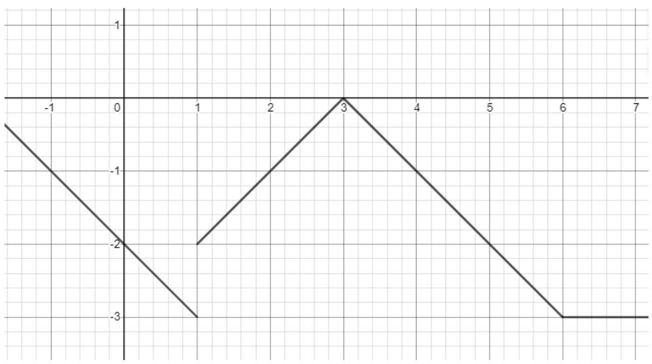
x	-2	-1	0	1	2	3
f(x)	-3	-2	1	4	-1	0
g(x)	-2	0	1	3	-1	2

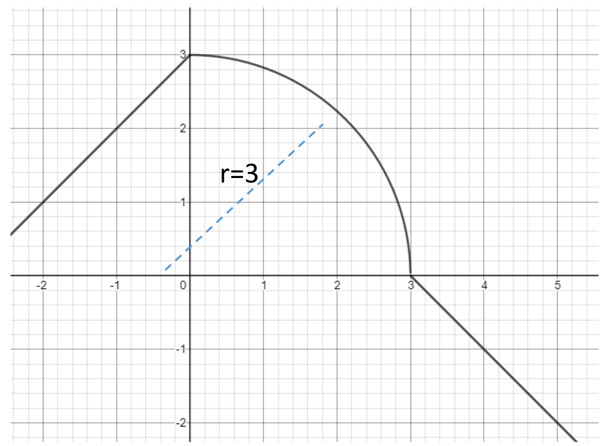
Compositions



Piecewise Functions:







Exponentials & Logarithms:

Properties of Exponents	**Let *a* and *b* be real #'s and let *m* and *n* be integers.**
Product of Powers	$a^m \cdot a^n = a^{m+n}$
Power of a Power	$(a^m)^n = a^{mn}$
Power of a Product	$(ab)^m = a^m b^m$
Negative Exponent	$a^{-m} = \frac{1}{a^m}, a \neq 0$
Zero Exponent	$a^0 = 1, a \neq 0$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$

$\log_e x = \ln x$

$\ln e = 1$

$\ln 1 = 0$

$\ln e^b = b$

$y = e^x$ & $y = \ln x$ are inverses

$\ln a^c = c \ln a$

$\ln(ab) = \ln a + \ln b$

$\ln \frac{a}{b} = \ln a - \ln b$

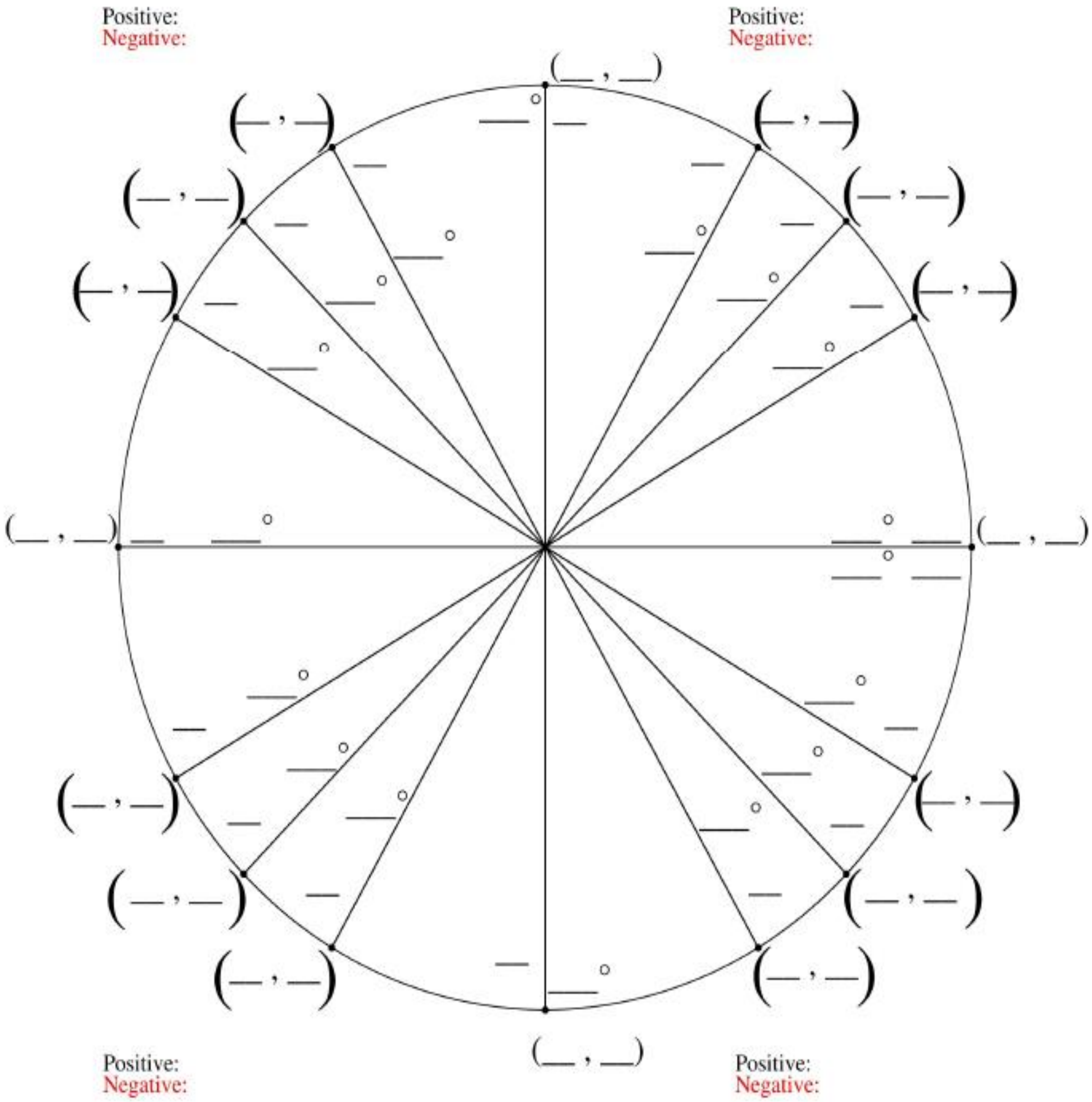
$e^{-x} = \frac{1}{e^x}$

$e^{\ln x} = x$

$a^{x+y} = a^x \cdot a^y$

$a^{x-y} = \frac{a^x}{a^y}$

The Unit Circle:



Trigonometric Identities

Reciprocal Identities	**Quotient Identities**
$\cot\theta = \dfrac{1}{\tan\theta}$ $\csc\theta = \dfrac{1}{\sin\theta}$ $\sec\theta = \dfrac{1}{\cos\theta}$	$\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$