Calculus – Lesson 4: Other Types of Functions (page 1)
Upward Bound Summer 2018 **Name: _____**

Basic: Absolute Value, Power, Exponential, and Logarithmic Functions

Recall that the absolute value function $f(x) = |x|$ will output the positive value of the input. This means that its range is just the positive numbers (and zero). The graph has a "V" shape.

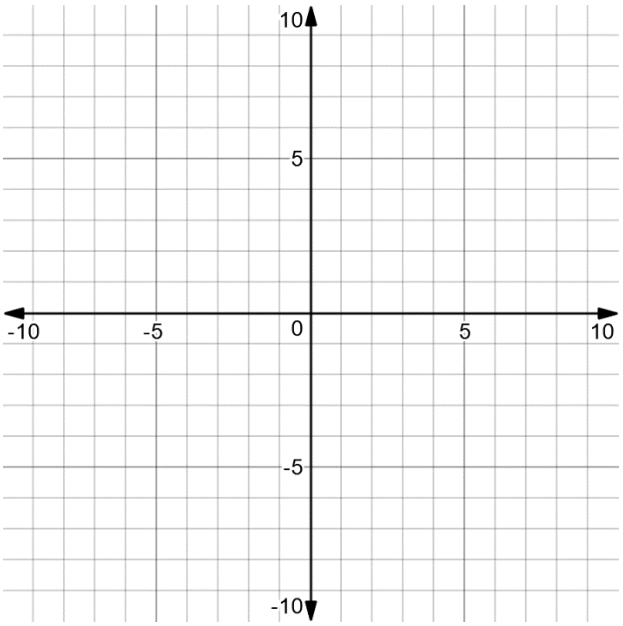
(1) Work with your partner to write two functions f and g which involve absolute value.

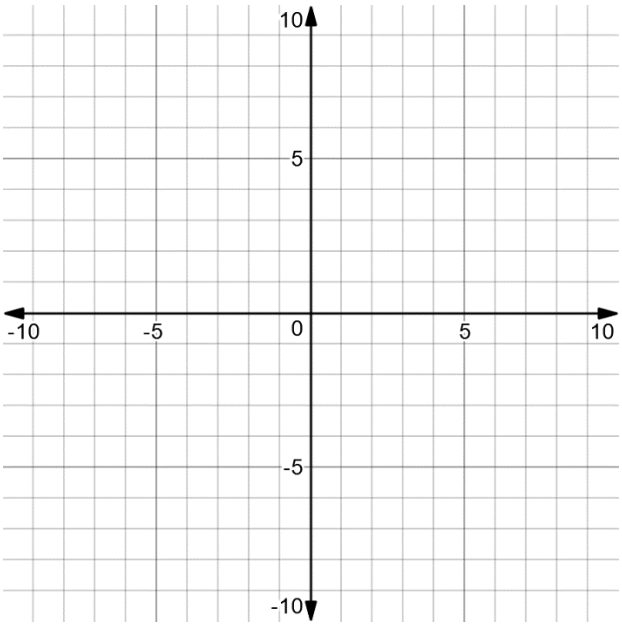
$f(x) =$ _____ $g(x) =$ _____

(2) Make a table of input and output values for each function defined in Problem #1.

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

(3) Graph each function from Problem #1. (Please ensure your chosen functions are visible on the grid.)





Recall that a power function $f(x) = kx^p$ with coefficient k and power p will look like a polynomial or rational function for integer values of p and a square or cube root for certain fraction values of p.

(4) Work with your partner to write two power functions f and g.

$f(x) =$ _____ $g(x) =$ _____

(5) Make a table of input and output values for each function defined in Problem #4.

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

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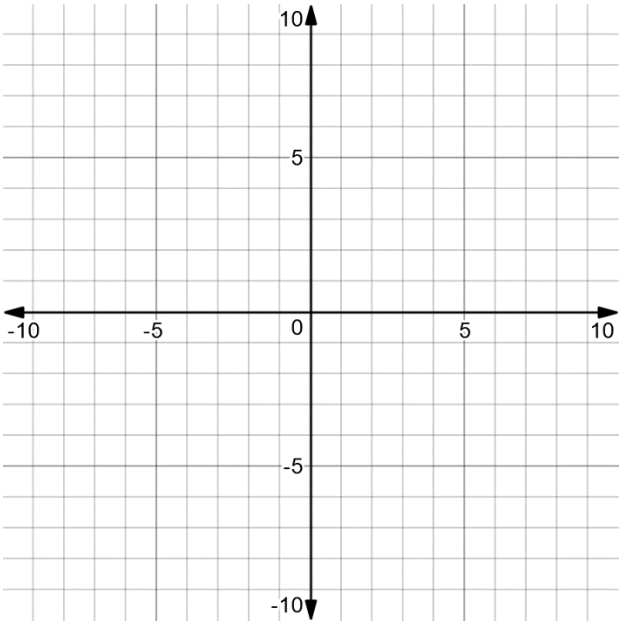
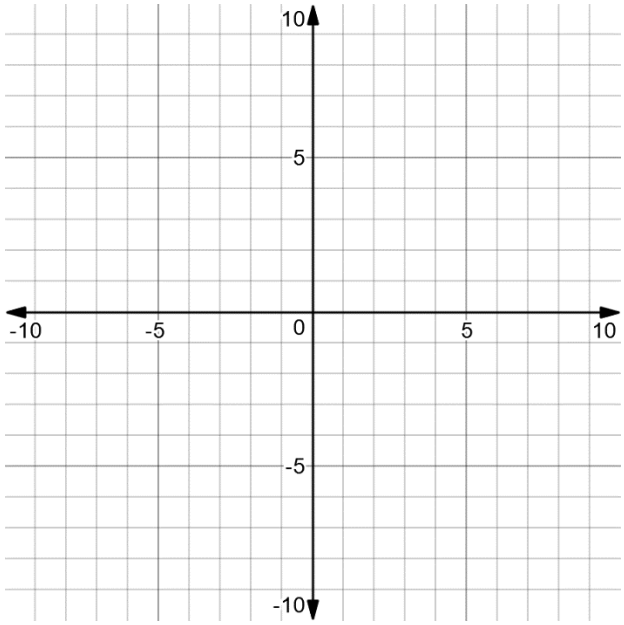
(6) Graph each function from Problem #4. (Please ensure your chosen functions are visible on the grid.)





Recall that an exponential function $f(x) = ab^x$ grows very quickly (faster than any polynomial) if $b > 1$ and decreases quickly toward 0 if $0 < b < 1$. Remember any exponential function may also be written in the form $f(x) = ae^{kx}$, where e is Euler's number (approximately 2.71).

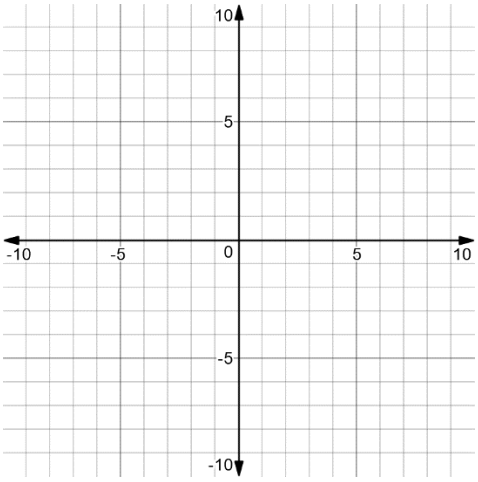
(7) Work with your partner to write two exponential functions f and g.

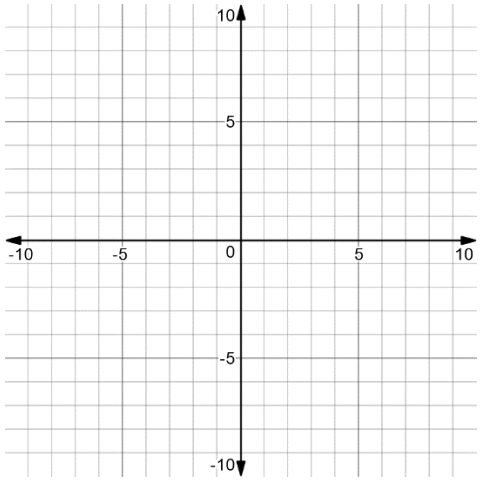
$f(x) =$ _____ $g(x) =$ _____

(8) Make a table of input and output values for each function defined in Problem #7.

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

(9) Graph each function from Problem #7. (Please ensure your chosen functions are visible on the grid.)





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Recall that the logarithm function is the inverse of the exponential function. Its graph therefore looks similar to an exponential graph, but it is a mirror image across the line $y = x$, so it has a vertical asymptote instead of a horizontal asymptote.

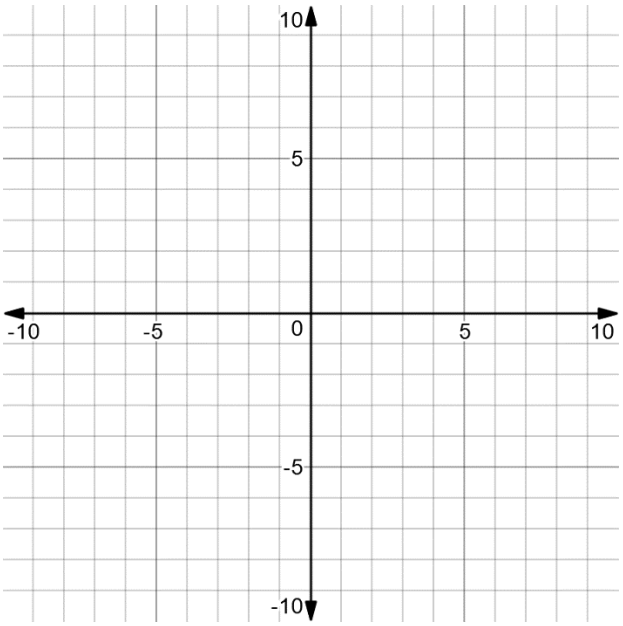
(10) Work with your partner to write two functions f and g which involve logarithms.

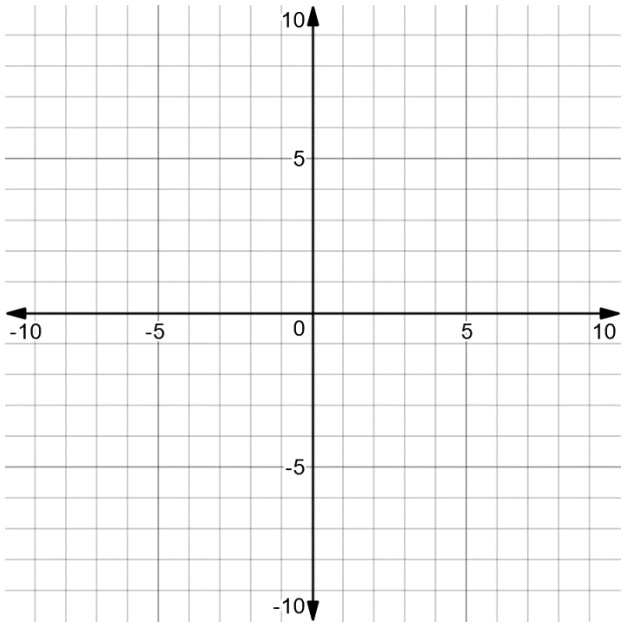
$f(x) =$ _____ $g(x) =$ _____

(11) Make a table of input and output values for each function defined in Problem #10.

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

(12) Graph each function from Problem #10. (Please ensure your chosen functions are visible on the grid.)





Intermediate: Trigonometric Functions

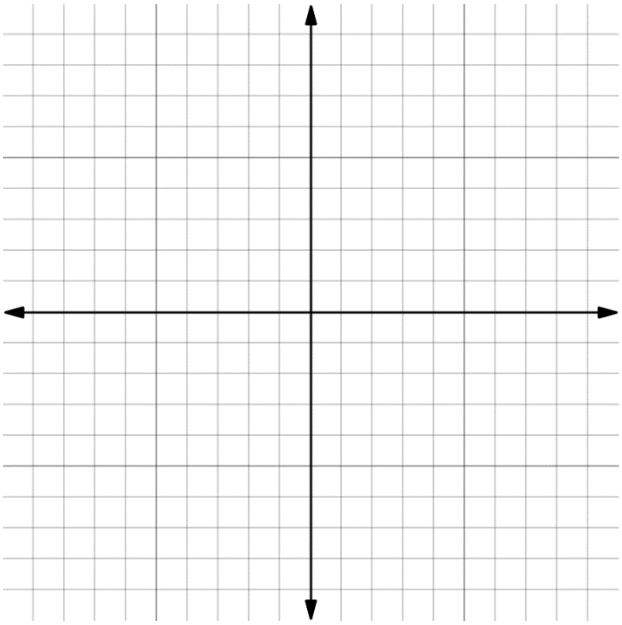
Recall that there are 6 different trig functions: sine, cosine, tangent, cotangent, secant, and cosecant.
The sine and cosine graphs both look like waves with default period 2π and default amplitude of 1.

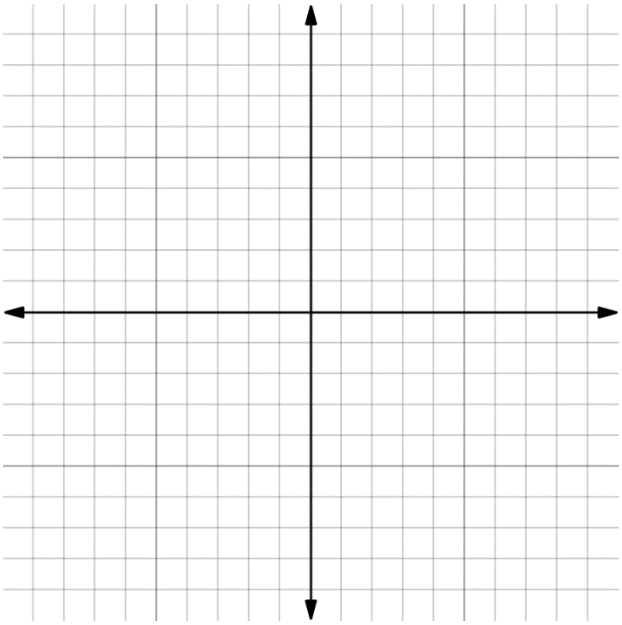
Let $f(x) = \sin(x)$ and $g(x) = \cos(x)$.

(13) Make a table of input and output values for each function.

x	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
$f(x)$							
$g(x)$							

(14) Graph each function.





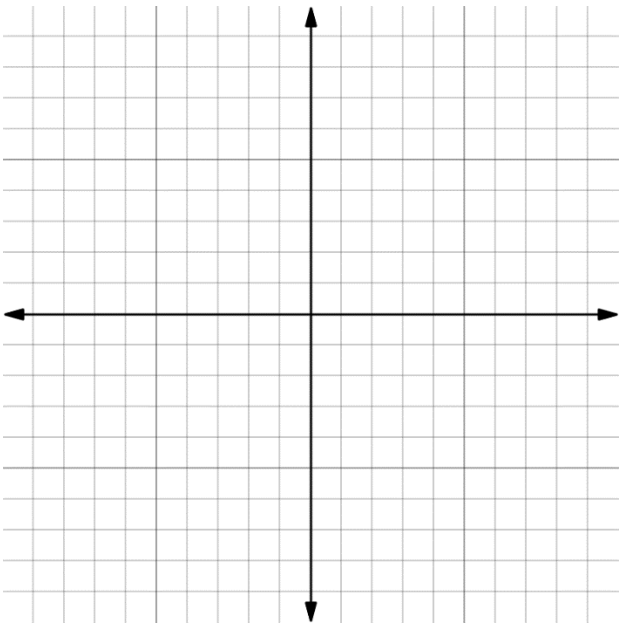
The tangent and cotangent graphs have default period π and a range covering all the real numbers.

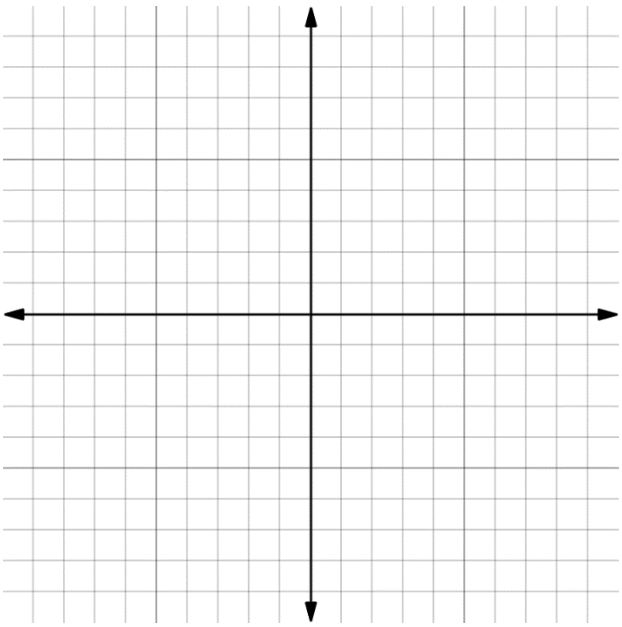
Let $f(x) = \tan(x)$ and $g(x) = \cot(x)$.

(15) Make a table of input and output values for each function.

x	$-\pi/2$	$-\pi/4$	0	$\pi/4$	$\pi/2$	$3\pi/4$	π
$f(x)$							
$g(x)$							

(16) Graph each function.





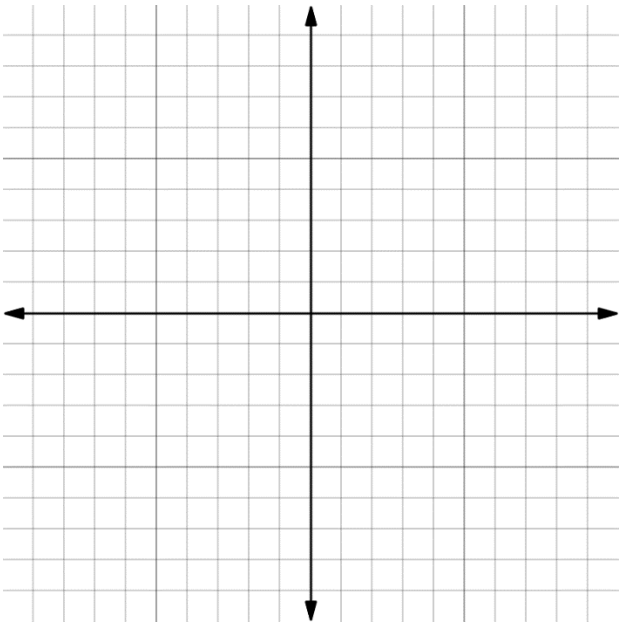
The secant and cosecant graphs have default period 2π and look like a collection of disconnected U's.

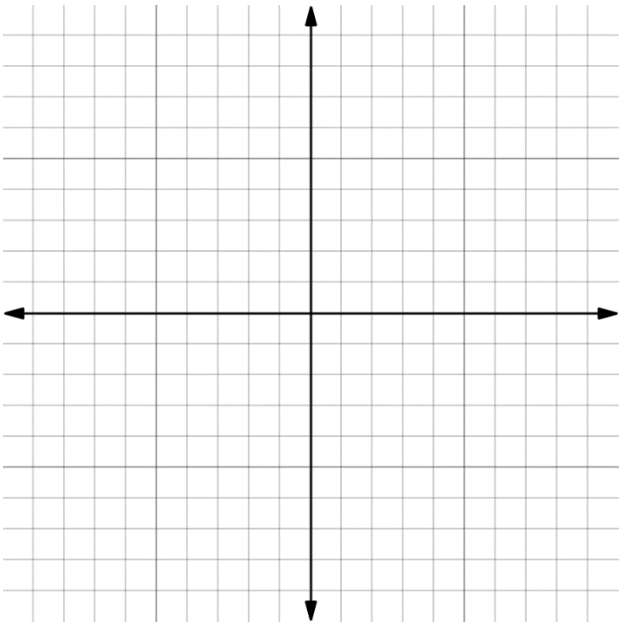
Let $f(x) = \sec(x)$ and $g(x) = \csc(x)$.

(17) Make a table of input and output values for each function.

x	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
$f(x)$							
$g(x)$							

(18) Graph each function.





Advanced: Piecewise-Defined Functions

A **piecewise-defined function** is a function which is defined differently on different parts of its domain.

For example, $f(x) = \begin{cases} -x, & x < 0 \\ -x^2, & x \geq 0 \end{cases}$

(19) Work with your partner to define another piecewise-defined function g.

$g(x) =$

(20) Make a table of input and output values for these functions.

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

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(21) Graph these functions. (Please ensure your chosen function is visible on the grid.)