

**Learning Outcomes:** What should you be able to after watching the videos?

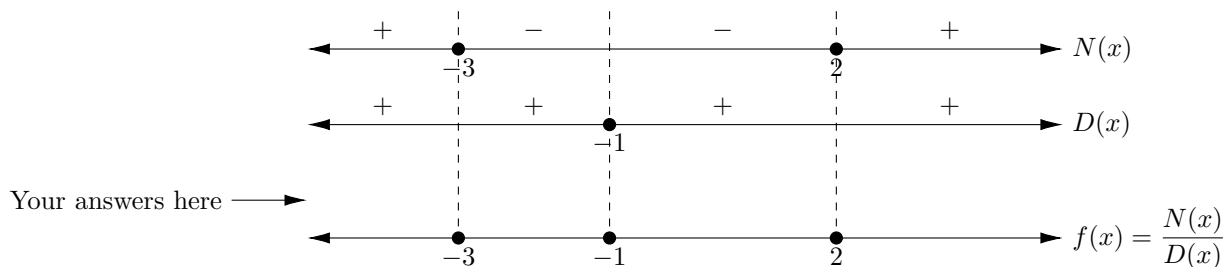
- Video 1: Graphing the Tangent Function
  - Identify the zeros and vertical asymptotes of quotient functions.
  - Use the signs of the numerator and denominator to determine sign of the quotient.
  - Identify the key values for the tangent function.
  - Graph transformed tangent functions using key values.
- Video 2: Graphing the Cotangent Function
  - Describe the relationship between a value and its reciprocal.
  - Identify the key values for the cotangent function.
  - Graph transformed cotangent functions using key values.
- Video 3: Transformations of Graphs
  - Graph the secant and cosecant functions using cosine and sine functions.
  - Graph transformed secant and cosecant functions.

**#1)** Consider the function  $f(x) = \frac{N(x)}{D(x)}$ , where  $N(x) = (x - 2)(x + 3)^2$  and  $D(x) = 3(x + 1)^2$ . State the zeros and vertical asymptotes of  $f(x)$ . Note that zeros are simply numbers, whereas vertical asymptotes are equations of lines of the form  $x = k$ .

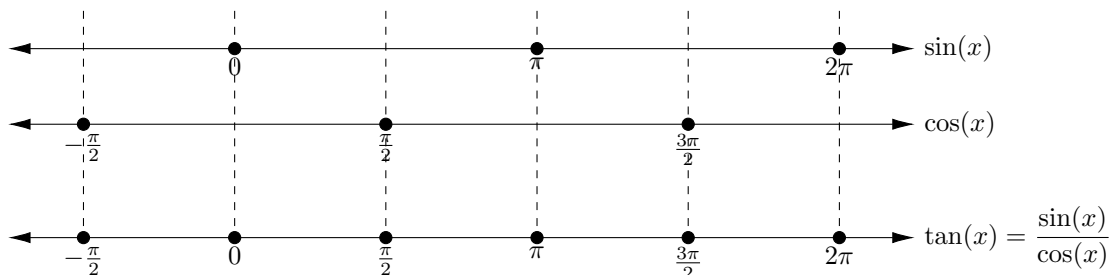
Zeros of  $f(x)$  [a list of numbers]:

Vertical asymptotes of  $f(x)$  [equations of lines]:

**#2)** The following diagram contains a number lines that demonstrate where the functions  $N(x)$  and  $D(x)$  (from the previous problem) are equal to zero and whether they are positive or negative on the intervals between those zeros. Use this information to determine whether  $f(x)$  is positive or negative on the indicated intervals.

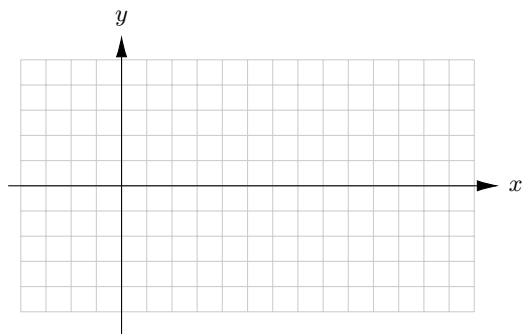


**#3)** Using the previous problem as a guide, complete the following diagram for function  $f(x) = \tan(x)$ .



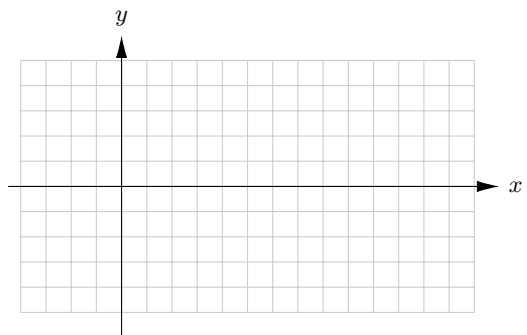
#4) Complete the following chart of key values for the tangent function and sketch the graph.

Key Values	1	2	3	4	5
$x$					
$y = \tan(x)$					



#5) Complete the following chart of key values for the transformed tangent function  $y = 2 \tan\left(\frac{x}{2} - \pi\right) - 2$  and sketch the graph. Include the calculation of the fundamental period and its subintervals.

Key Values	1	2	3	4	5
$x$					
$y$					



#6) Complete each of the following blanks with one of the following phrases: LARGE positive, LARGE negative, small positive, small negative.

$$\frac{1}{\text{LARGE positive}} = \boxed{\phantom{000000}}$$

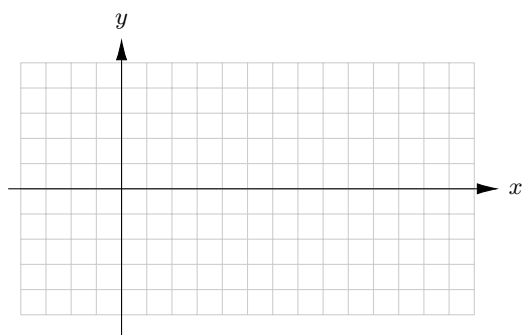
$$\frac{1}{\text{small positive}} = \boxed{\phantom{000000}}$$

$$\frac{1}{\text{small negative}} = \boxed{\phantom{000000}}$$

$$\frac{1}{\text{LARGE negative}} = \boxed{\phantom{000000}}$$

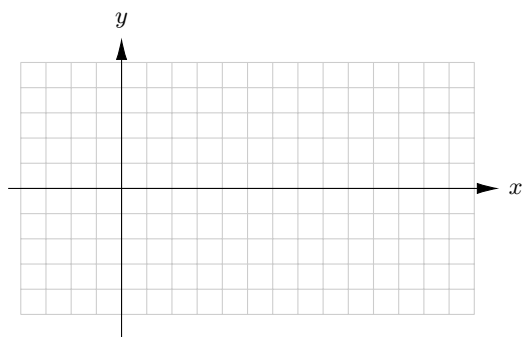
#7) Complete the following chart of key values for the cotangent function and sketch the graph.

Key Values	1	2	3	4	5
$x$					
$y = \cot(x)$					

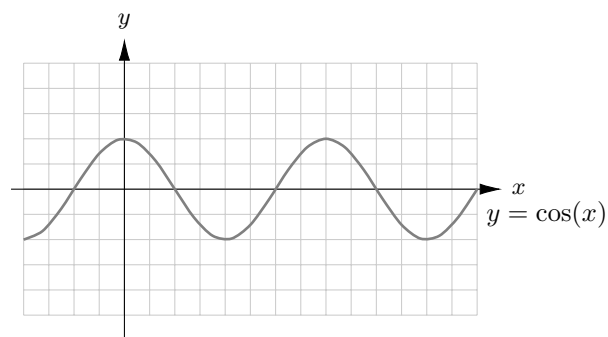
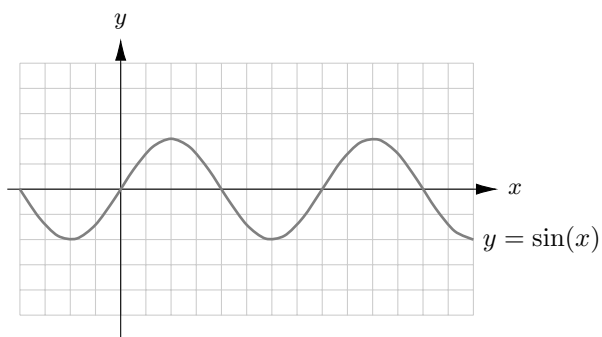


#8) Complete the following chart of key values for the transformed tangent function  $y = -2 \cot\left(\frac{x}{4}\right)$  and sketch the graph. Include the calculation of the fundamental period and its subintervals.

Key Values	1	2	3	4	5
$x$					
$y$					

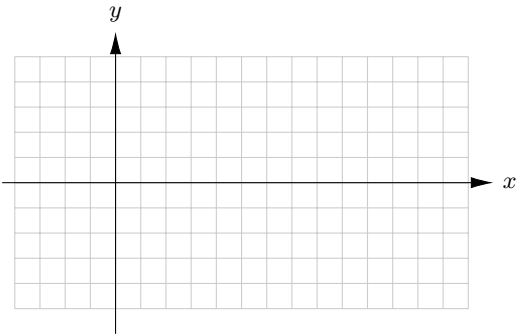


#9) The graphs of the cosine and sine functions are plotted below. Use these to sketch the secant and cosecant functions, including graphing the asymptotes. Include the equations of the vertical asymptotes.



**#10)** Complete the following chart of key values for the transformed cosine function  $y = -2 \cos (2x + \pi) + 1$  and sketch the graph. Use that graph to sketch  $y = -2 \sec (2x + \pi) + 1$ .

Key Values	1	2	3	4	5
$x$					
$y$					



Was any aspect of any of the videos confusing or unclear? Do you have any questions?