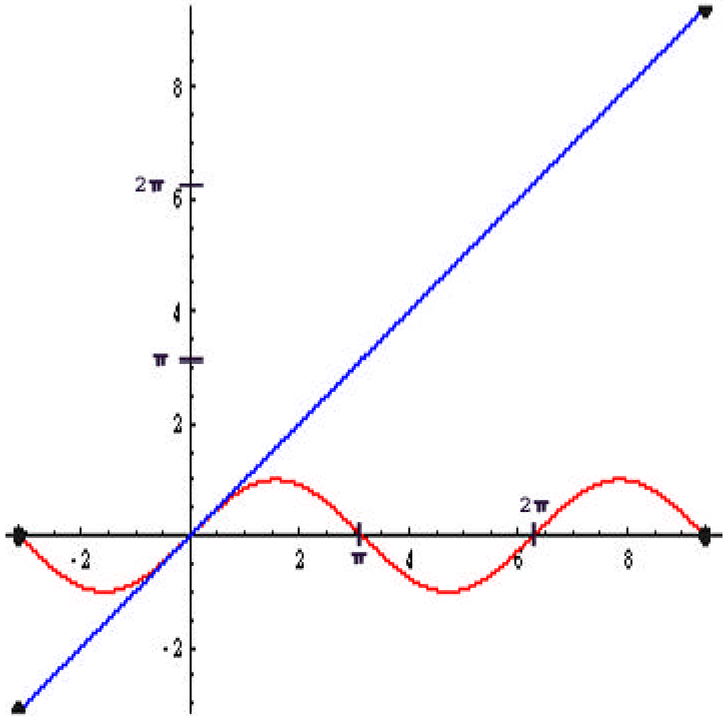
Math 128 NAME:

Inverses of Trigonometric Functions Cosine, Sine, and Tangent

1. Reflect the graph of y = sin x about the line y = x. You'll recall this creates the inverse of the function y = sin x, which "undoes" y = sin x. We denote this inverse relationship by $y = \sin^{-1}x$.

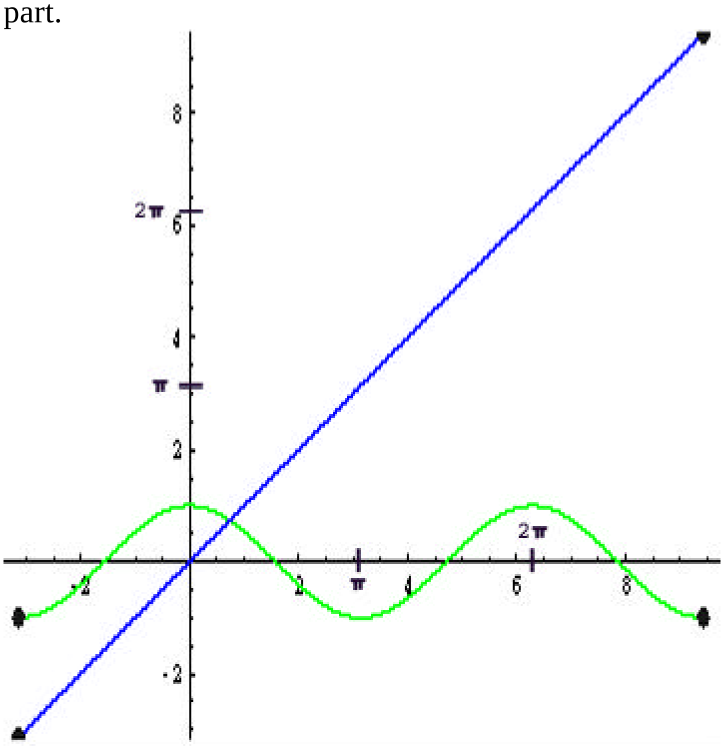


2. You'll notice that the reflection is not a function. It has more than one y value for many of the x values. How could we restrict the domain of y = sin x so that its inverse was a function? There are many correct answers here. Select an interval of x values for the original function so that its inverse is a function.

3. The usual domain restriction for y = sin x is $-\frac{p}{2} \le x \le \frac{p}{2}$. Concentrate only on this portion of the graphs to complete this table.

$\sin^{-1}(.7) =$	$\sin(p/4) =$
$\sin^{-1}(0) =$	$\sin(0) =$
$\sin^{-1}(1) =$	$\sin(p/2) =$

4. Reflect the graph of y = cos x about the line y = x. This creates the inverse of the function y = cos x, denoted by y = $\cos^{-1}$x. Just as before the inverse is not a function unless the domain of y = cos x is restricted. We usually restrict the domain of y = cos x to $0 \le x \le \pi$. Cross out the remainder of the graph and only reflect the restricted domain part.

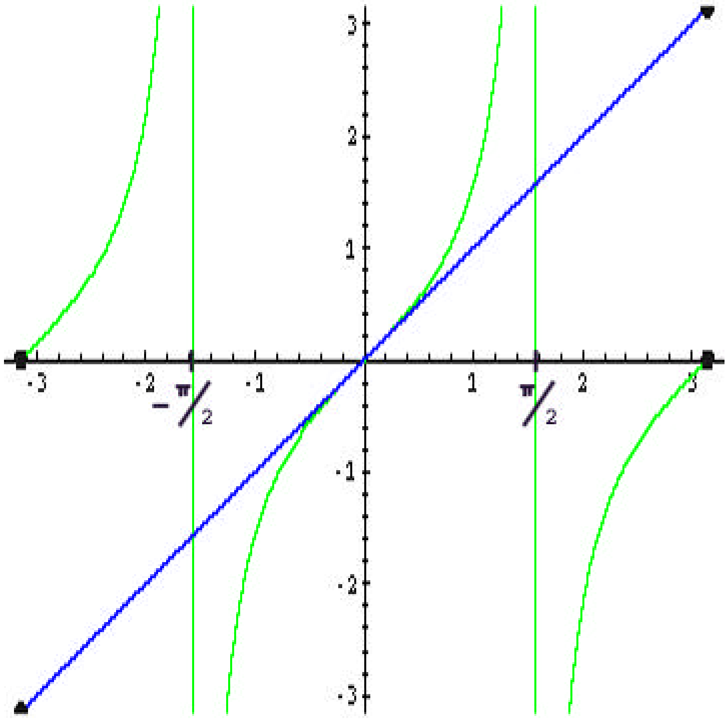


5. The usual domain restriction for y = cos x is $0 \le x \le \pi$. We will only need this portion of the graphs to complete this table.

$\cos^{-1}(.7)$ =	cos (π /4) =
$\cos^{-1}(0)$ =	cos (π /2) =
$\cos^{-1}(-.5)$ =	cos (2π /3) =

6. Notice if f(x) = cos x and g(x) = $\cos^{-1}$x are inverses, then f(g(x)) = x or rather, cos($\cos^{-1}$ (x)) = x or alternatively $\cos^{-1}$ (cos (x)) = x. Similar things can be said of y = sin x and y = $\sin^{-1}$x. Use the results of numbers three and five above to verify these equations.

7. Consider this graph of y = tan x with the restricted domain of $-\frac{p}{2} < x < \frac{p}{2}$. (Notice the values -$p$ /2 and p /2 are not included as the function is undefined at these values.) Reflect it over the y = x line. Only reflect that part in the restricted domain.



8. Using the wording of asymptotes, describe the graph of y = $\tan^{-1}$x.

9. Use your graphs with the appropriate restricted domains to fill in the following table.

Original Trig Fnc	**Original Trig Fnc's Domain**	**Original Trig Fnc's Range**	**Inverse**	**Inverse's Domain**	**Inverse's Range**
y = sin x	$-\frac{p}{2} \le x \le \frac{p}{2}$		y = $\sin^{-1}$x		
y = cos x	$0 \le x \le p$		y = $\cos^{-1}$x		
y = tan x	$-\frac{p}{2} < x < \frac{p}{2}$		y = $\tan^{-1}$x		

10. What is true of the relationship between the domain and range of a trig function and that of its inverse?