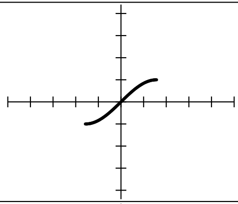
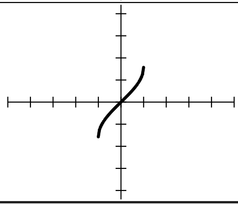
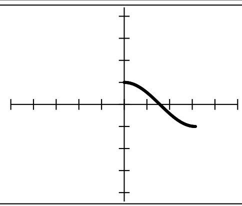
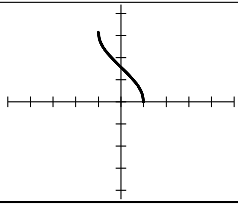
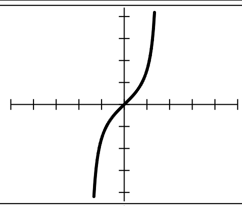
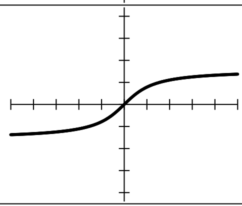
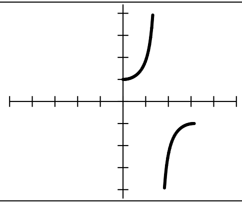
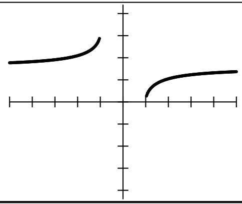
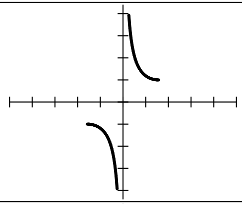
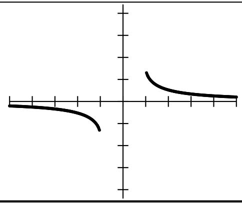
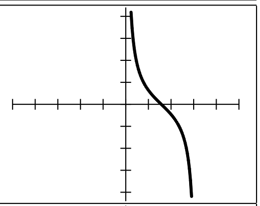
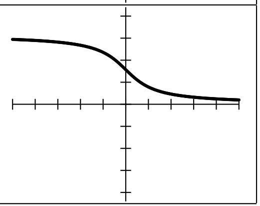
Recall the trig functions are not one-to-one. So we have to restrict their domains to get inverses. We then get the inverse trig functions by switching domains and ranges and reflecting the graphs across the line $y = x$.

FUNCTION	DOMAIN	RANGE	GRAPH
$y = \sin(x)$	$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ QI & IV	$-1 \leq y \leq 1$	
$y = \sin^{-1}(x)$	$-1 \leq x \leq 1$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$ QI & IV	
$y = \cos(x)$	$0 \leq x \leq \pi$ QI & II	$-1 \leq y \leq 1$	
$y = \cos^{-1}(x)$	$-1 \leq x \leq 1$	$0 \leq y \leq \pi$ QI & II	
$y = \tan(x)$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$ QI & IV	$-\infty < y < \infty$	
$y = \tan^{-1}(x)$	$-\infty < x < \infty$	$-\frac{\pi}{2} < y < \frac{\pi}{2}$ QI & IV	

FUNCTION	DOMAIN	RANGE	GRAPH
$y = \sec(x)$	$0 \leq x \leq \pi \ \ (x \neq \frac{\pi}{2})$ QI & II	$(-\infty, -1] \cup [1, \infty) \ \ (\lvert y \rvert \geq 1)$	
$y = \sec^{-1}(x)$	$(-\infty, -1] \cup [1, \infty) \ \ (\lvert x \rvert \geq 1)$	$0 \leq y \leq \pi \ \ (y \neq \frac{\pi}{2})$ QI & II	
$y = \csc(x)$	$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2} \ \ (x \neq 0)$ QI & IV	$(-\infty, -1] \cup [1, \infty) \ \ (\lvert y \rvert \geq 1)$	
$y = \csc^{-1}(x)$	$(-\infty, -1] \cup [1, \infty) \ \ (\lvert x \rvert \geq 1)$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2} \ \ (y \neq 0)$ QI & IV	
$y = \cot(x)$	$0 \leq x \leq \pi$ QI & II	$-\infty < y < \infty$	
$y = \cot^{-1}(x)$	$-\infty < x < \infty$	$0 \leq y \leq \pi$ QI & II	

Derivatives of Inverse Trig Functions

$$\frac{d}{dx}\left[\sin^{-1}(x)\right] = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\left[\tan^{-1}(x)\right] = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\left[\sec^{-1}(x)\right] = \frac{1}{|x|\sqrt{x^2-1}}$$

$$\frac{d}{dx}\left[\cos^{-1}(x)\right] = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\left[\cot^{-1}(x)\right] = \frac{-1}{1+x^2}$$

$$\frac{d}{dx}\left[\csc^{-1}(x)\right] = \frac{-1}{|x|\sqrt{x^2-1}}$$