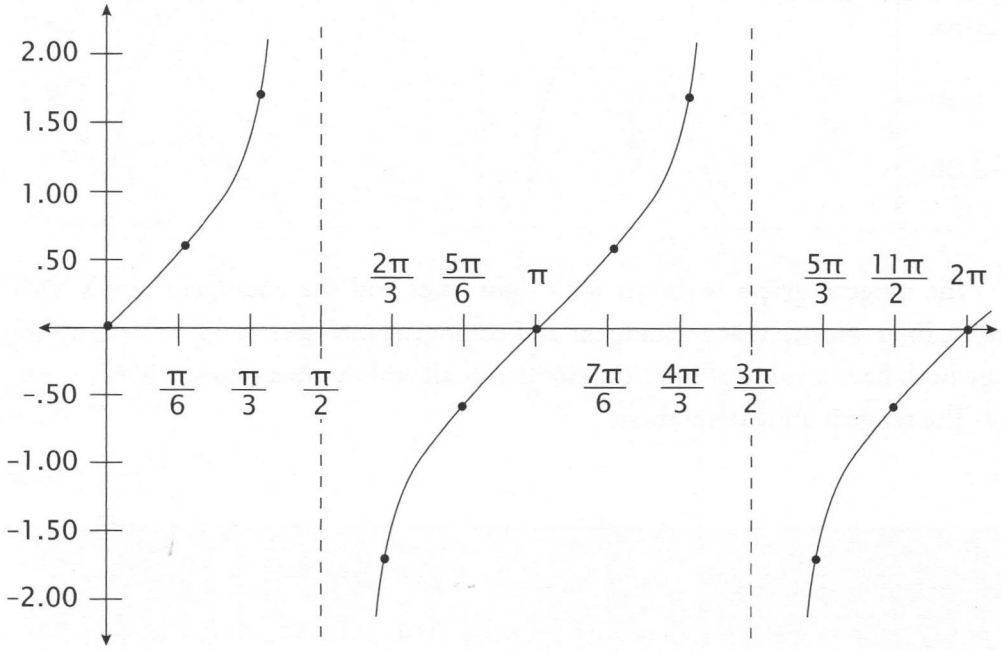
LESSON 25

Graphing the Tangent and Cotangent

Since tangent $\theta = \sin\theta/\cos\theta$, we'll put the sine and cosine together. Cos θ can not be equal to zero since tan θ would then be undefined. So, there will be asymptotes when cos θ approaches zero.

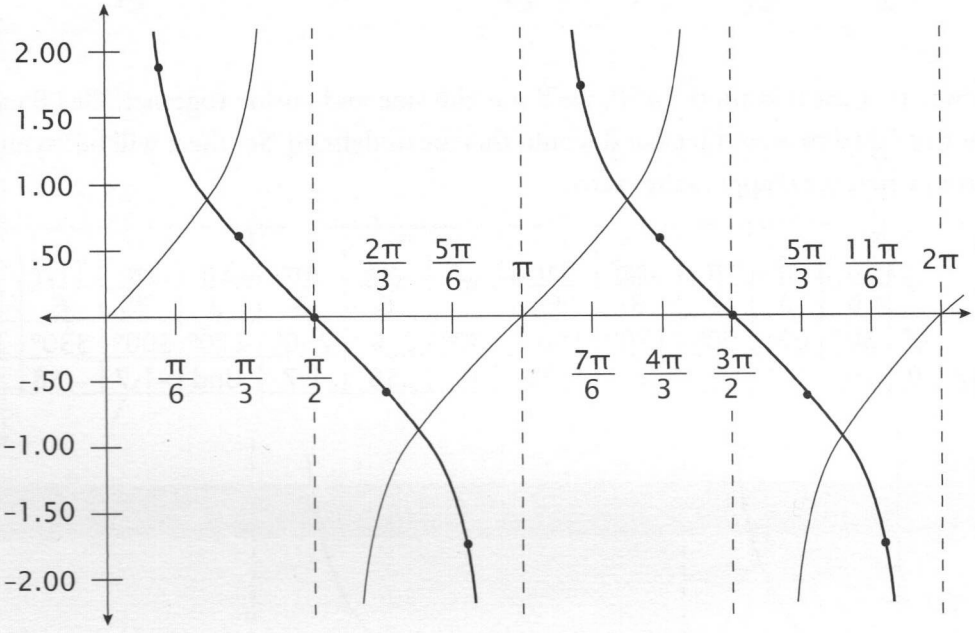
x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
tanx	0	.58	1.7	Und	-1.7	-.58	0	.58	1.7	Und	-1.7	-.58	0



The amplitude is infinite. The domain is all the real numbers except $n\pi + \pi/2$. The range is all the real numbers. Note that the period is π rather than 2π.

To graph the cotangent, consider that it is 1/tan x or cos x/sin x. Right away we can see that whenever the sin x is zero, the cotangent will be undefined. Where the function is undefined, we will find our asymptotes. The sin x is zero at 0°, 180°, and 360°. Let's make a table and observe the data.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
tan x	0	.58	1.7	Und	−1.7	−.58	0	.58	1.7	Und	−1.7	−.58	0
cot x	Und	1.7	.58	0	−.58	−1.7	Und	1.7	.58	0	−.58	−1.7	Und



The tangent graph is drawn with light lines and the cotangent graph with darker lines. Notice that the tangent and cotangent intersect at 45° or $\pi/4$, where they both have a value of one. The domain is all real numbers except 0, π, 2π, $n\pi$, etc. The range is all real numbers.

Practice Problems 1

Find the shift, period, and translation of each function, and then sketch the graph. (Note that the amplitude affects the shape of the curve, but does not define the upper limits of the graph because the lines continue to infinity.)

1. $y = \cot 2x + 1$

2. $y = 2 \tan(x - \frac{\pi}{2})$