

Math 150, Section 6.4

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Purpose of This Section

In this section we learn the following

- ▶ How to graph tangent, cotangent, cosecant and secant functions.

Periodic properties

The functions tangent and cotangent have period π :

$$\tan(x + \pi) = \tan x \quad \cot(x + \pi) = \cot x$$

The functions cosecant and secant have period 2π :

$$\csc(x + 2\pi) = \csc x \quad \sec(x + 2\pi) = \sec x$$

- ▶ Tangent and secant functions have vertical asymptotes at $\frac{\pi}{2} + n\pi$ for any integer n .
- ▶ Cotangent and cosecant functions have vertical asymptotes at $n\pi$ for any integer n .

Graphing $y = a \tan k(x - b)$

- ▶ The period is $\frac{\pi}{k}$
- ▶ Start of a period is $b - \frac{\pi}{2k}$
- ▶ End of a period is $b + \frac{\pi}{2k}$
- ▶ Vertical asymptotes at $b - \frac{\pi}{2k}$ and $b + \frac{\pi}{2k}$

Graphing $y = a \cot k(x - b)$

- ▶ The period is $\frac{\pi}{k}$
- ▶ Start of a period is b
- ▶ End of a period is $b + \frac{\pi}{k}$
- ▶ Vertical asymptotes at b and $b + \frac{\pi}{k}$

Graphing $y = a \csc k(x - b)$

- ▶ The period is $\frac{2\pi}{k}$
- ▶ Start of a period is b
- ▶ End of a period is $b + \frac{2\pi}{k}$
- ▶ Vertical asymptotes at b , $b + \frac{\pi}{k}$ and $b + \frac{2\pi}{k}$

Graphing $y = a \sec k(x - b)$

- ▶ The period is $\frac{2\pi}{k}$
- ▶ Start of a period is b
- ▶ End of a period is $b + \frac{2\pi}{k}$
- ▶ Vertical asymptotes at $b + \frac{\pi}{2k}$ and $b + \frac{3\pi}{2k}$