Section 5.3b: Graphs of the Tangent and Cotangent Functions

Remember $\tan x = \frac{\sin x}{\cos x}$, so where $\cos(x) = 0$, $\tan(x)$ has an asymptote and where $\sin(x) = 0$, $\tan(x)$ has an $x$-intercept.

**Tangent:** $f(x) = \tan x$

---

**How to graph** $y = A \tan(Bx - C)$:

1. The period is given by $\frac{\pi}{B}$. Find two consecutive asymptotes by setting $Bx - C$ equal to $-\frac{\pi}{2}$ and $\frac{\pi}{2}$, then solve for $x$.

2. Find the $x$-intercept by taking the average of the two points on the $x$-axis where consecutive asymptotes pass.

3. Find the points on the graph \(\frac{1}{4}\) and \(\frac{3}{4}\) of the way between the consecutive asymptotes. The $y$-coordinates of these points are $-A$ and $A$. 

---

Domain:____________________

Range:____________________

Period:____________________

Vertical Asymptotes:

___________________________

$x$- intercepts:

___________________________

$y$- intercept:______________
Example 1: Graph $f(x) = \tan\left(\frac{x}{2} - \frac{\pi}{4}\right)$ over one period.
Remember \( \cot x = \frac{\cos x}{\sin x} \), so where \( \sin(x) = 0 \), \( \tan(x) \) has an asymptote and where \( \cos(x) = 0 \), \( \tan(x) \) has an \( x \)-intercept.

**Cotangent:** \( f(x) = \cot x \)

- **Domain:**
- **Range:**
- **Period:**
- **Vertical Asymptotes:**
- **\( x \)-intercepts:**
- **\( y \)-intercept:**

**How to graph** \( y = A \cot(Bx - C) \):

1. The period is given by \( \frac{\pi}{B} \). Find two consecutive asymptotes by setting \( Bx - C \) equal to 0 and \( \pi \), then solve for \( x \).
2. Find the \( x \)-intercept by taking the average of the two points on the \( x \)-axis where consecutive asymptotes pass.
3. Find the points on the graph \( \frac{1}{4} \) and \( \frac{3}{4} \) of the way between the consecutive asymptotes. The \( y \)-coordinates of these points are \(-A\) and \( A\).
Example 2: Graph $y = \cot 2x$ over one period.
Example 3: Sketch $f(x) = \cot \left( x - \frac{\pi}{2} \right) - 2$