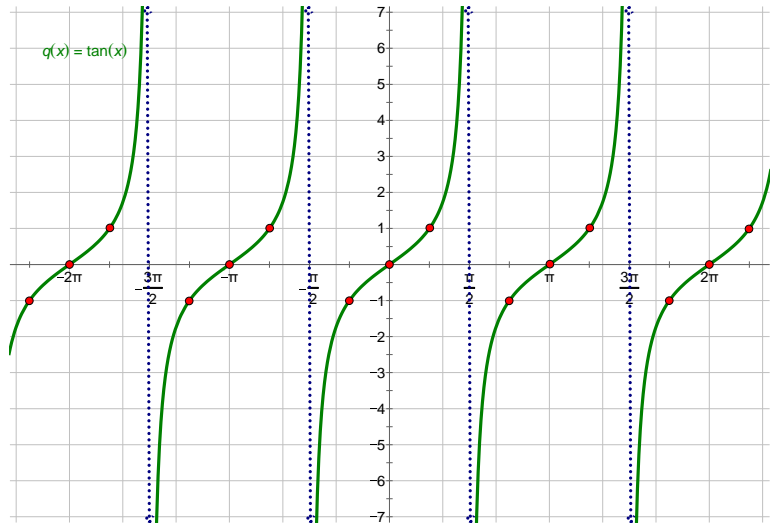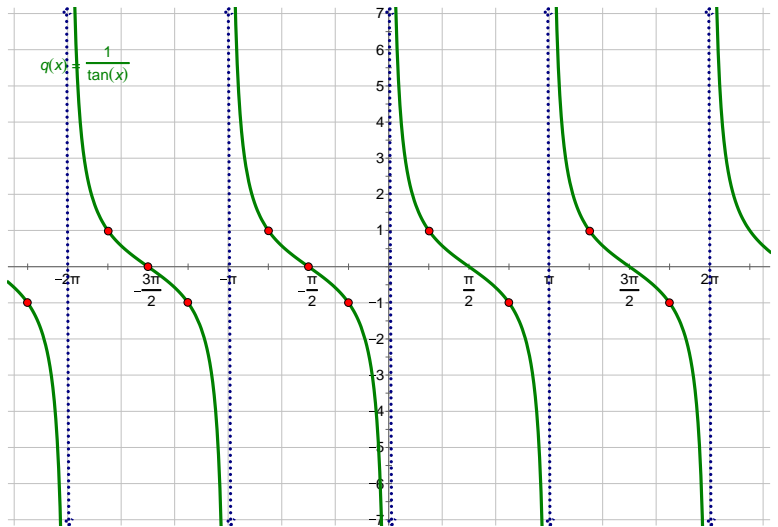| Topic	Notes	Examples/Questions

Parent Functions

$f(x) = \tan x$

$f(x) = \cot x$

Understanding the Parent Functions

Vertical Asymptotes:
- Because $\tan x = \dfrac{\sin x}{\cos x}$, there are vertical asymptotes everywhere $\cos x = 0$. There are roots everywhere $\sin x = 0$.
- Note: Roots always occur at the midpoint between vertical asymptotes.

Additional Points:
- Because $\tan x = \dfrac{\sin x}{\cos x}$, $\tan x = 1$ where $\cos x = \sin x$. Likewise, $\tan x = -1$ where $\cos x = -\sin x$.
- Note: The parent function is always $= \pm 1$ at the midpoint between the roots and the vertical asymptotes.

Note: For cotangent, just reverse sine and cosine in all the statements above.

Steps for Sketching Tangent and Cotangent(6)

Rewrite the function in terms if sine and cosine.

1) Find the vertical asymptotes by setting the denominator = to 0. Plot them.

2) Plot the centerline of the graph by identifying the vertical shift (***k***).

3) Mark all "roots" on the centerline at the midpoints between the asymptotes.

4) Plot the additional points at the midpoints between the roots and the vertical asymptotes. The y-values of these points are **± *a***.

5) Sketch the cot/tan by drawing cubic-like curves between the asymptotes and through the points marked steps 4 & 5.

Example

$f(x) = \dfrac{1}{2} \cdot \tan(3 \cdot x - \pi) - 2$

1) Find vertical asymptotes.
2) Plot the centerline (k)
3) Mark "roots" at midpoints
4) Plot additional points.
Note: $a = \dfrac{1}{2}$.
5) Sketch the graph.