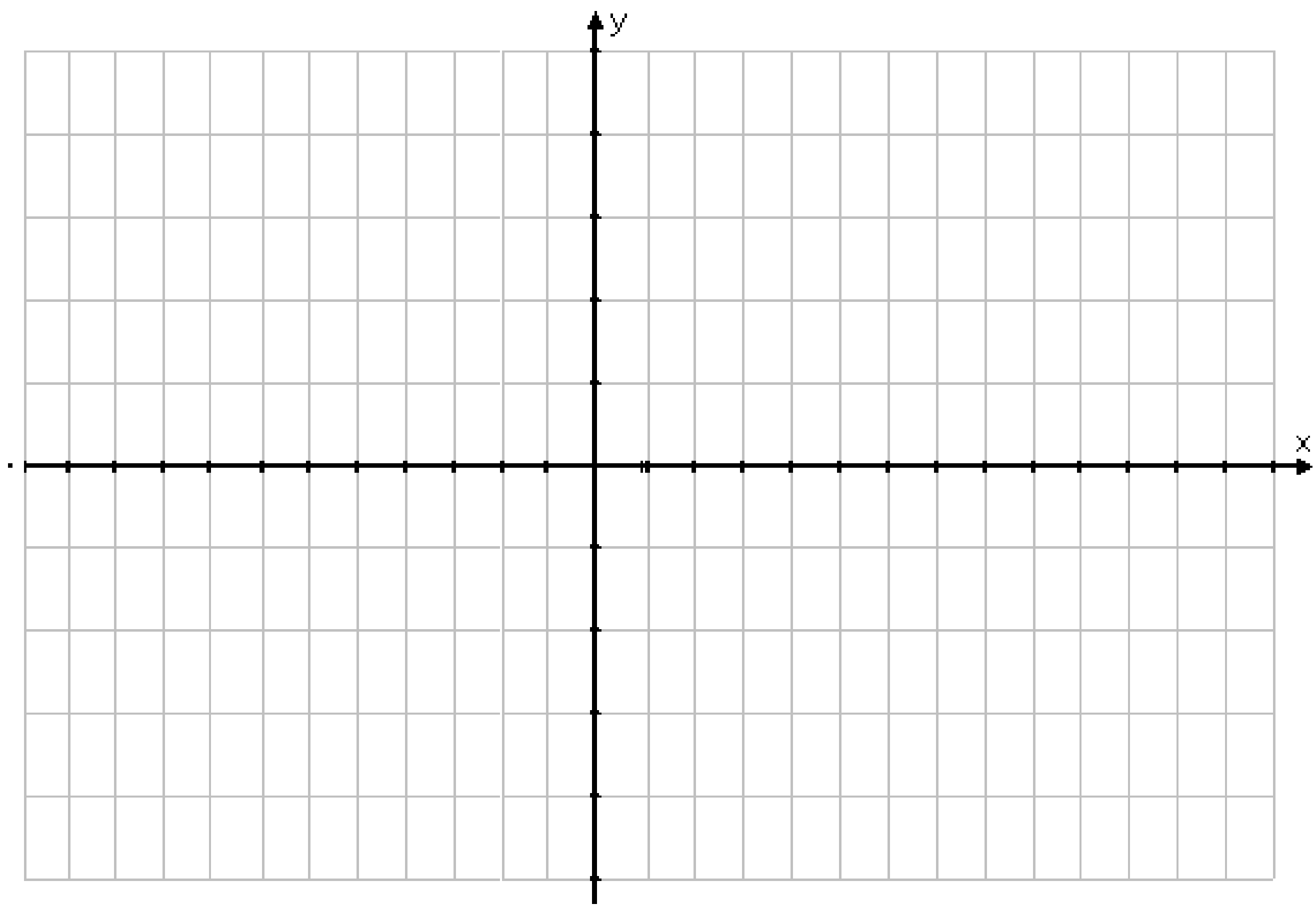
## 4.1 GRAPHING THE SINE FUNCTION

Complete the table of values for $y = \sin(\theta)$.

| $\theta°$ | -360° | -270° | -180° | -90° | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\frac{3\pi}{2}$ | $-\pi$ | $-\frac{\pi}{2}$ | 0 | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ |
| y | | | | | | | | | |

Let 6 spaces represent $\pi$ along the $\theta$-axis. Let 2 spaces along the y-axis represent 1 unit. Scale the axes. Then, plot each $(\theta, y)$ point. Then, join the points in a smooth curve. Using your calculator, determine the points in Quadrants II and III.
Then, extend your graph to cover the domain $-2\pi \leq \theta \leq 2\pi$.

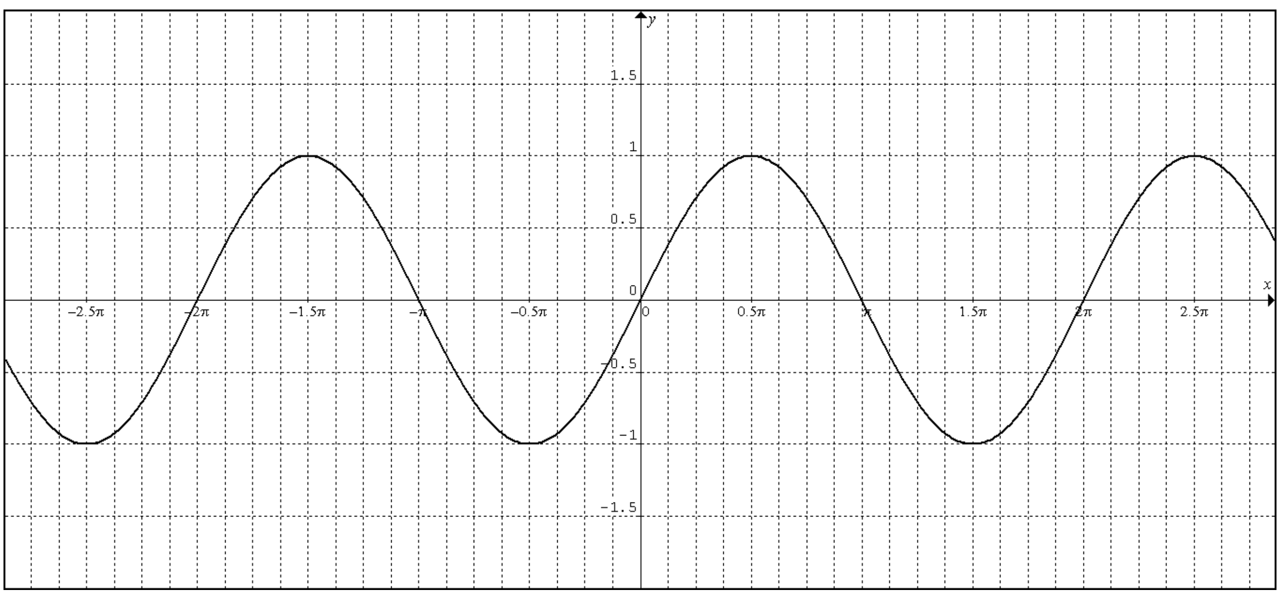


# GRAPHING THE COSECANT FUNCTION

Complete the table of values for $y = \csc(\theta)$. Remember, $\csc(\theta) = \dfrac{1}{\sin(\theta)}$. To find the y-values for the graph $y = \csc\theta$, first evaluate $y = \sin(\theta)$. Then, take the reciprocal. (Your calculator has a 1/x button or an $x^{-1}$ button that will give the reciprocal of an input.)

| $\theta°$ | -360° | -270° | -180° | -90° | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\dfrac{3\pi}{2}$ | $-\pi$ | $-\dfrac{\pi}{2}$ | 0 | $\dfrac{\pi}{2}$ | $\pi$ | $\dfrac{3\pi}{2}$ | $2\pi$ |
| y | | | | | | | | | |

Notice if $\sin(\theta) = 0$, then $\csc(\theta)$ is undefined. An undefined value for y implies that there is a vertical asymptote at the corresponding $\theta$ value, so draw a vertical dotted line at these locations. Plot the values of $y = \csc(\theta)$ and draw smooth curves through the points for each defined region. Notice that the graph for $y = \sin(\theta)$ has been penciled in so you can make comparisons between it and the graph of $y = \sec(\theta)$.

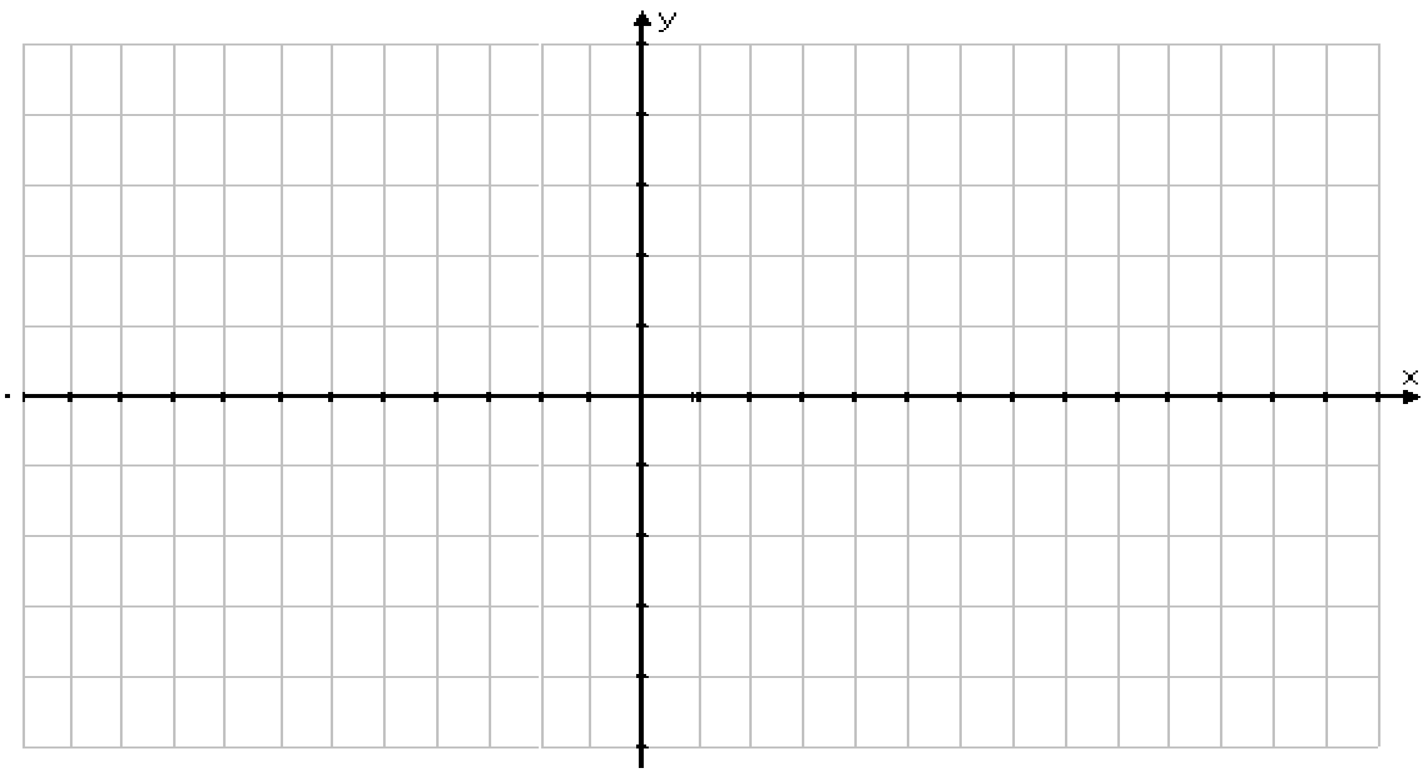


GRAPHING THE COSINE FUNCTION

Complete the table of values for $y = \cos(\theta)$.

| $\theta°$ | -360° | -270° | -180° | -90° | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\frac{3\pi}{2}$ | $-\pi$ | $-\frac{\pi}{2}$ | 0 | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ |
| y | | | | | | | | | |

Let 6 spaces represent $\pi$ along the $\theta$-axis. Let 2 spaces along the y-axis represent 1 unit. Scale the axes. Then, plot each $(\theta, y)$ point. Then, join the points in a smooth curve. Using your calculator, determine the points in Quadrants II and III. Then, extend your graph to cover the domain $-2\pi \le \theta \le 2\pi$.

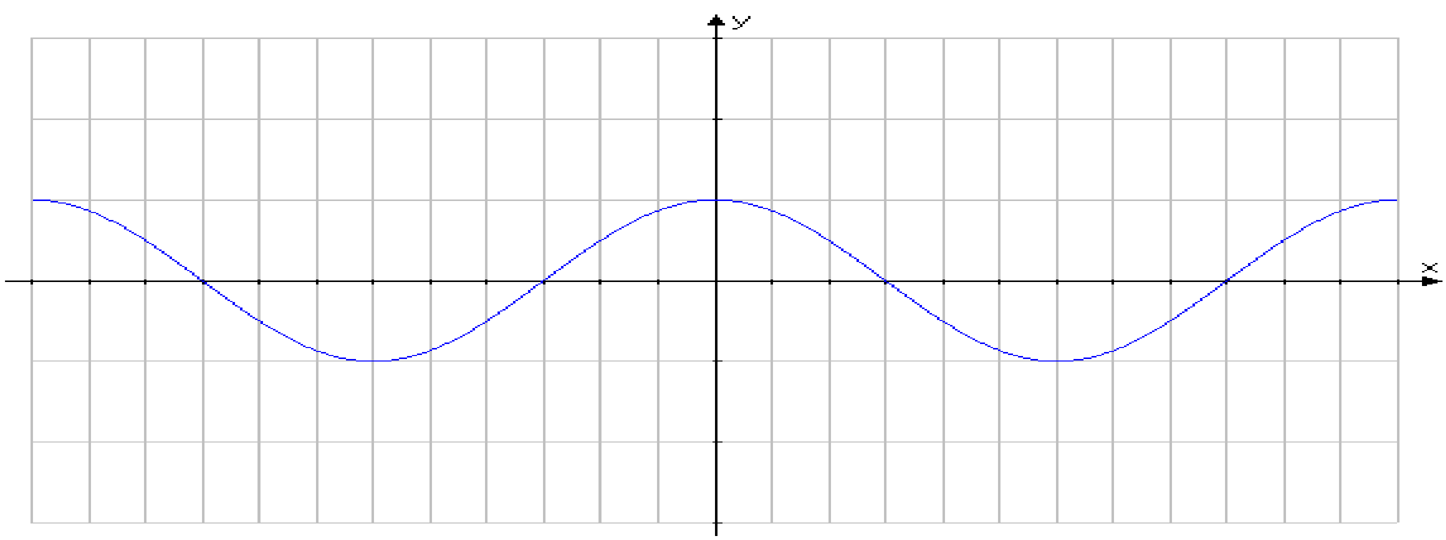


# GRAPHING THE SECANT FUNCTION

Complete the table of values for $y = \sec(\theta)$. Remember, $\sec(\theta) = \dfrac{1}{\cos(\theta)}$. To find the y-values for the graph $y = \sec(\theta)$, first evaluate $y = \cos(\theta)$. Then, take the reciprocal. (Your calculator has a 1/x button or an $x^{-1}$ button that will give the reciprocal of an input.)

| $\theta°$ | -360° | -270° | -180° | -90° | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\dfrac{3\pi}{2}$ | $-\pi$ | $-\dfrac{\pi}{2}$ | 0 | $\dfrac{\pi}{2}$ | $\pi$ | $\dfrac{3\pi}{2}$ | $2\pi$ |
| y | | | | | | | | | |

Notice if $\cos(\theta) = 0$, then $\sec(\theta)$ is undefined. An undefined value for y implies that there is a vertical asymptote at the corresponding $\theta$ value, so draw a vertical dotted line at these locations. Plot the values of $y = \sec(\theta)$ and draw smooth curves through the points for each defined region. Notice that the graph for $y = \cos(\theta)$ has been penciled in so you can make comparisons between it and the graph of $y = \sec(\theta)$.



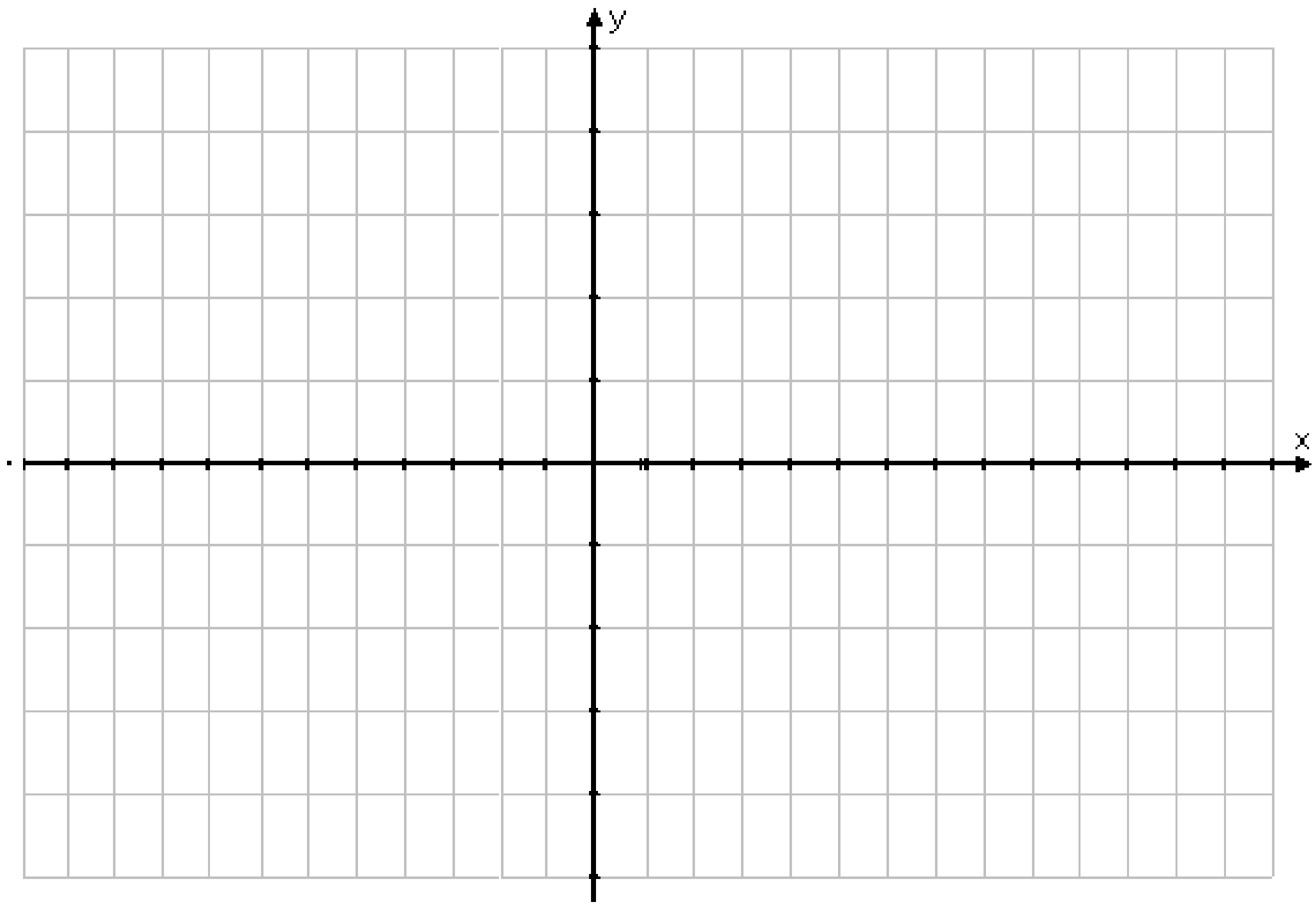
GRAPHING THE TANGENT FUNCTION

Complete the table of values for $y = \tan(\theta)$. Then graph the function.

| $\theta°$ | -360° | -270° | -180° | -90° | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\frac{3\pi}{2}$ | $-\pi$ | $-\frac{\pi}{2}$ | 0 | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ |
| Y | | | | | | | | | |

Notice if $y = \tan(\theta)$ is undefined, then there is a vertical asymptote at this value for $\theta$.

Draw a dotted line parallel to the y-axis. Your curve should approach these asymptotes closely, but not touch or cross them. Plot the $(\theta, y)$ points and draw smooth curves through the points for each defined region.

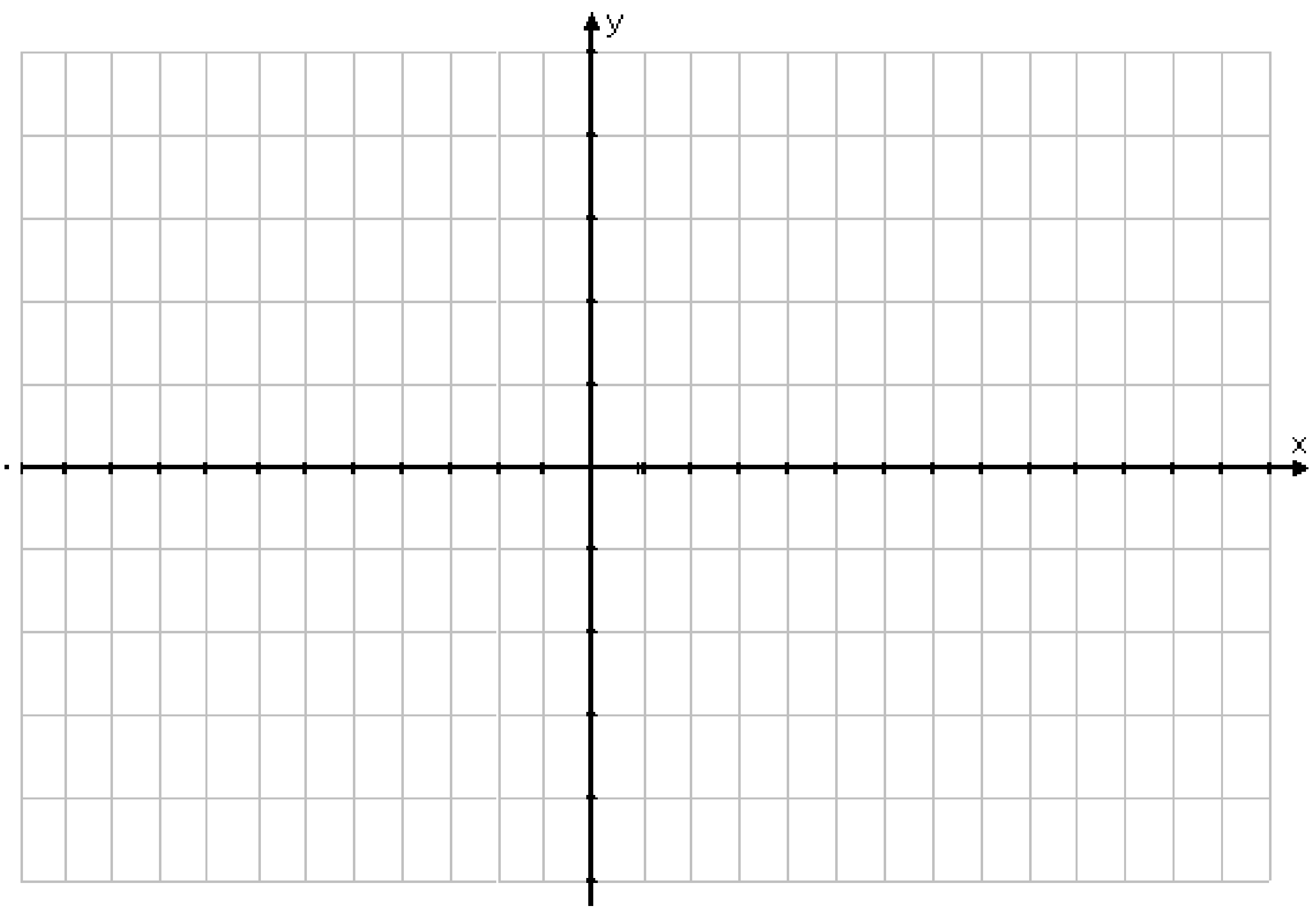


## GRAPHING THE COTANGENT FUNCTION

Complete the table of values for $y = \cot(\theta)$. Remember, $\cot(\theta) = \dfrac{1}{\tan(\theta)}$. To find the y-values for the graph $y = \cot(\theta)$ first evaluate $y = \tan(\theta)$. Then, take the reciprocal. (Your calculator has a 1/x button or an $x^{-1}$ button. )

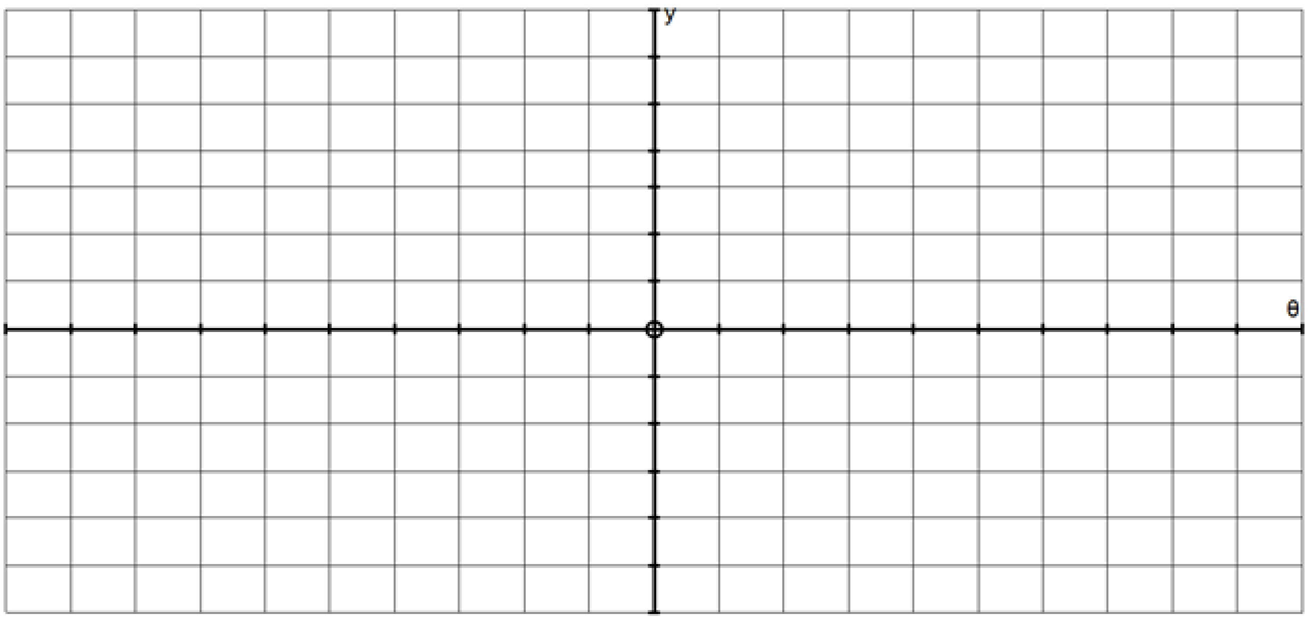
| $\theta°$ | $-360°$ | $-270°$ | $-180°$ | $-90°$ | $0°$ | $90°$ | $180°$ | $270°$ | $360°$ |
|---|---|---|---|---|---|---|---|---|---|
| Radian Measure | $-2\pi$ | $-\frac{3\pi}{2}$ | $-\pi$ | $-\frac{\pi}{2}$ | 0 | $\frac{\pi}{2}$ | $\pi$ | $\frac{3\pi}{2}$ | $2\pi$ |
| y | | | | | | | | | |

Notice if $\tan(\theta) = 0$, then $\cot(\theta)$ is undefined. An undefined value for y implies that there is a vertical asymptote at the corresponding $\theta$ value, so draw a vertical dotted line at these locations. Also, notice that if $\tan(\theta)$ is undefined, then $\cot(\theta) = 0$. Plot the values of $y = \cot(\theta)$ and draw smooth curves through the points for each defined region.



## Warm up

1. Graph one complete cycle of $y = -3\cos\frac{1}{4}\left(\theta + \frac{\pi}{3}\right) + 1$.




2. The graph of $y = 6\cos\left(x + \frac{3\pi}{4}\right) + 1$ is illustrated below. Determine the exact values of $\boldsymbol{g}$,$\boldsymbol{h}$,$\boldsymbol{m}$ and **n**.