



Activity 26 Cosecant and cotangent


Aim: Investigate the cosecant and cotangent reciprocal trigonometric ratios.

The construction from the previous activity will be used for the cosecant activity. See previous instructions regarding the construction and animation.

Measure the angle

- Select segment OT
- Select the angle measure  from the pull down menu
- Tap the table button 

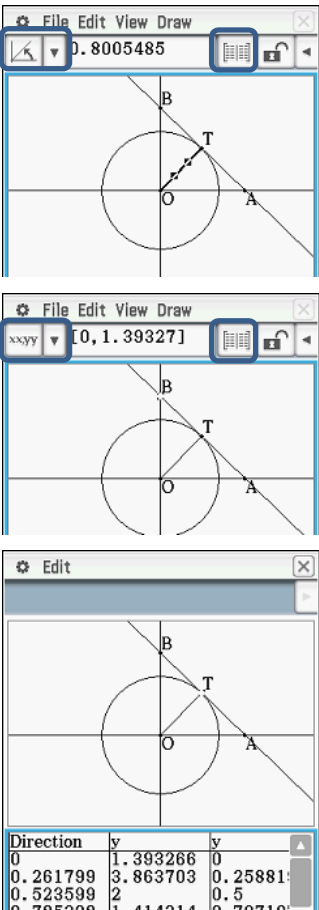
Measure the cosecant

- Select point B
- In the Measure pull-down menu ensure co-ordinates  are selected
- Tap the table button
- Select column x then [Edit | Delete]

Measure the sine

- Select point T
- Tap the table button
- Select column x then [Edit | Delete]

You should have three columns of data: the angle θ , the cosecant values $\text{cosecant}(\theta)$ and the sine values $\sin(\theta)$ respectively from left to right.




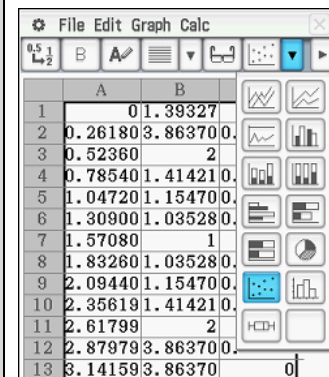
Direction	y	v
0	1.393266	0
0.261799	3.863703	0.25881
0.523599	2	0.5
0.785399	1.414214	0.70710

The cosecant of angle θ , abbreviated to $\text{csc}(\theta)$, is given by the vertical position of point B.

The cosecant ratio is the reciprocal of the sine ratio, i.e. $\text{csc}(\theta) = \frac{1}{\sin(\theta)}$.

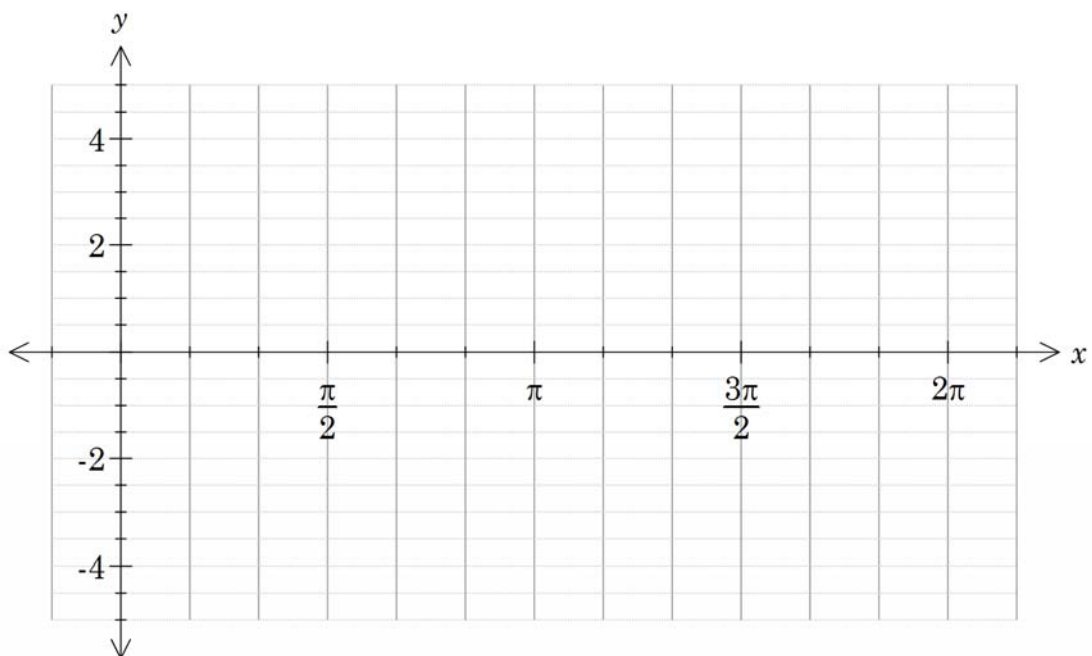
Graph the data

- Select the three columns of data
- [Edit | Copy]
- Open the Spreadsheet application
- [File | New] if necessary
- [Edit | Paste] the values
- Draw a scattergraph of the data  from the dropdown menu



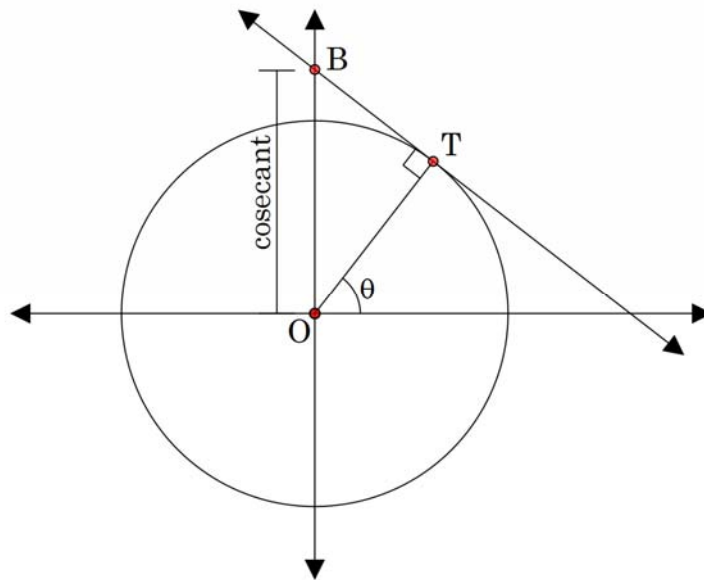
	A	B
1	0	1.39327
2	0.26180	3.86370
3	0.52360	2
4	0.78540	1.41421
5	1.04720	1.15470
6	1.30900	1.03528
7	1.57080	1
8	1.83260	1.03528
9	2.09440	1.15470
10	2.35619	1.41421
11	2.61799	2
12	2.87979	3.86370
13	3.14159	3.86370

1. Draw a neat sketch of the sine and cosecant graphs on the axes below, noting key features of roots and asymptotes. Beware: there are erroneous values for $\csc(\theta)$ at $0, \pi$ and 2π .



2. Not surprisingly given the reciprocal definitions, the graphs of the secant and cosecant ratios are related. Write an identity relating secant and cosecant together.

3. Consider again the unit circle definition of cosecant. Note that $OT = 1$ unit.



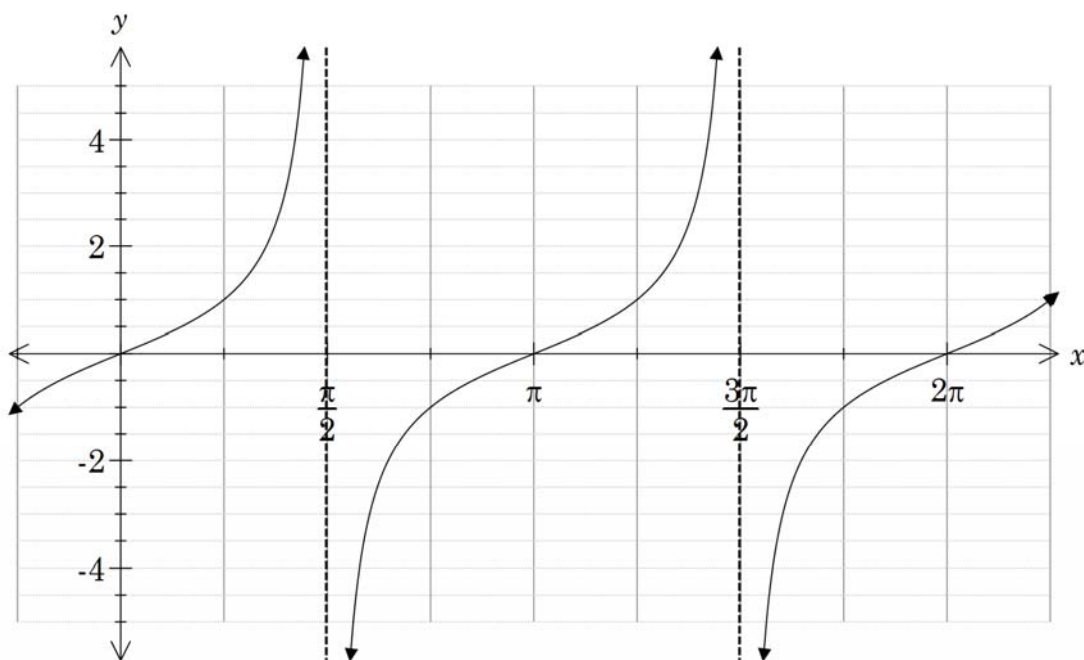
- a) Prove that $\angle OBT = \theta$.
- b) Justify the reciprocal relationship $\csc(\theta) = \frac{1}{\sin(\theta)}$.
- c) Justify the reciprocal relationship $\cot(\theta) = \frac{1}{\tan(\theta)}$.

d) The cotangent (abbreviated cot) ratio is defined as $\cot(\theta) = \frac{1}{\tan(\theta)}$.

Use Pythagoras to write an identity relating $\cot(\theta)$ and $\csc(\theta)$.

e) Prove the identity in d).

4. The graph of $y = \tan(x)$ is shown below. Sketch the graph of $y = \cot(x)$ on the same axes.



5. Check your answer to Q4 by graphing $y = \frac{1}{\tan(x)}$ in Graph&Table.