After completing this chapter you should know

1 the functions secant θ, cosecant θ and cotangent θ

2 the graphs of sec θ, cosec θ and cot θ

3 how to solve equations and prove identities involving sec θ, cosec θ and cot θ

4 how to prove and use the identities
$1 + \tan^2\theta = \sec^2\theta$
and $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

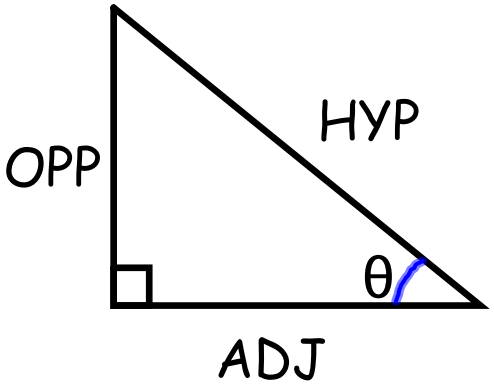
5 how to sketch and use the inverse trigonometric functions $\arcsin x$, $\arccos x$ and $\arctan x$.

6

Trigonometry

6.1 You need to know the functions secant θ, cosecant θ and cotangent θ.

In Y9 we learned that



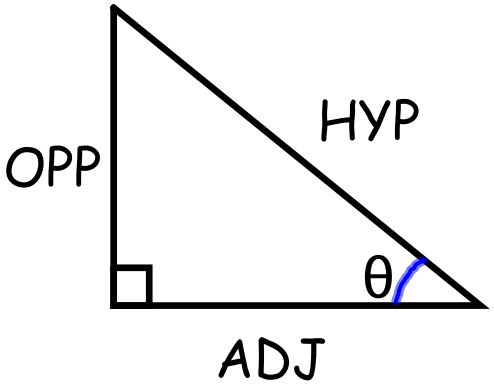
$$\text{Sin } \theta = \frac{\text{OPP}}{\text{HYP}}$$

$$\text{Cos } \theta = \frac{\text{ADJ}}{\text{HYP}}$$

$$\text{Tan } \theta = \frac{\text{OPP}}{\text{ADJ}}$$

The Six Trigonometric Identities

In Y9 we learned that



$$\text{Sin } \theta = \frac{\text{OPP}}{\text{HYP}}$$

$$\text{Cos } \theta = \frac{\text{ADJ}}{\text{HYP}}$$

$$\text{Tan } \theta = \frac{\text{OPP}}{\text{ADJ}}$$

But why not

$$= \frac{\text{HYP}}{\text{OPP}}$$

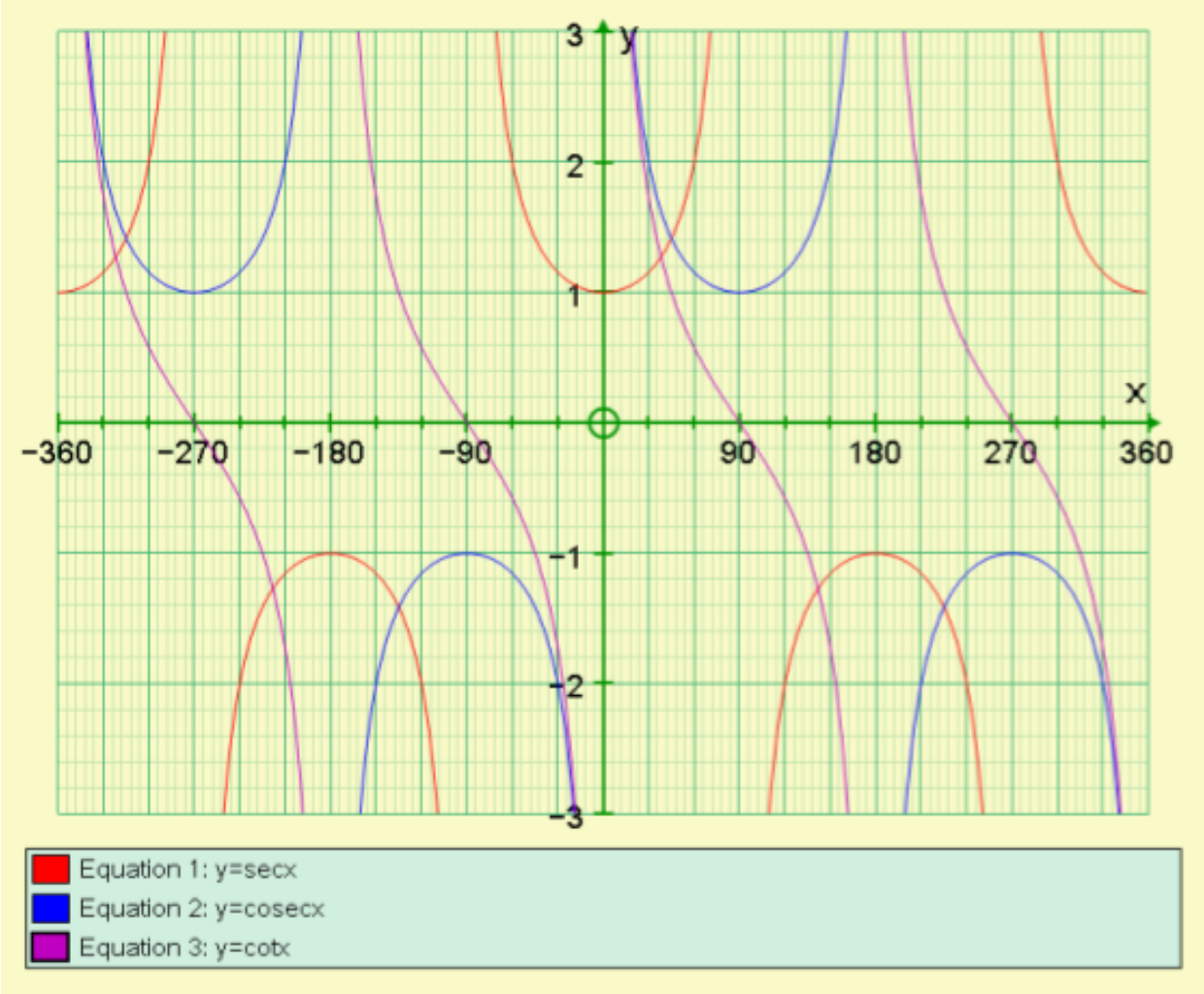
$$= \frac{\text{HYP}}{\text{ADJ}}$$

$$= \frac{\text{ADJ}}{\text{OPP}}$$

6.1 You need to know the functions secant θ, cosecant θ and cotangent θ.

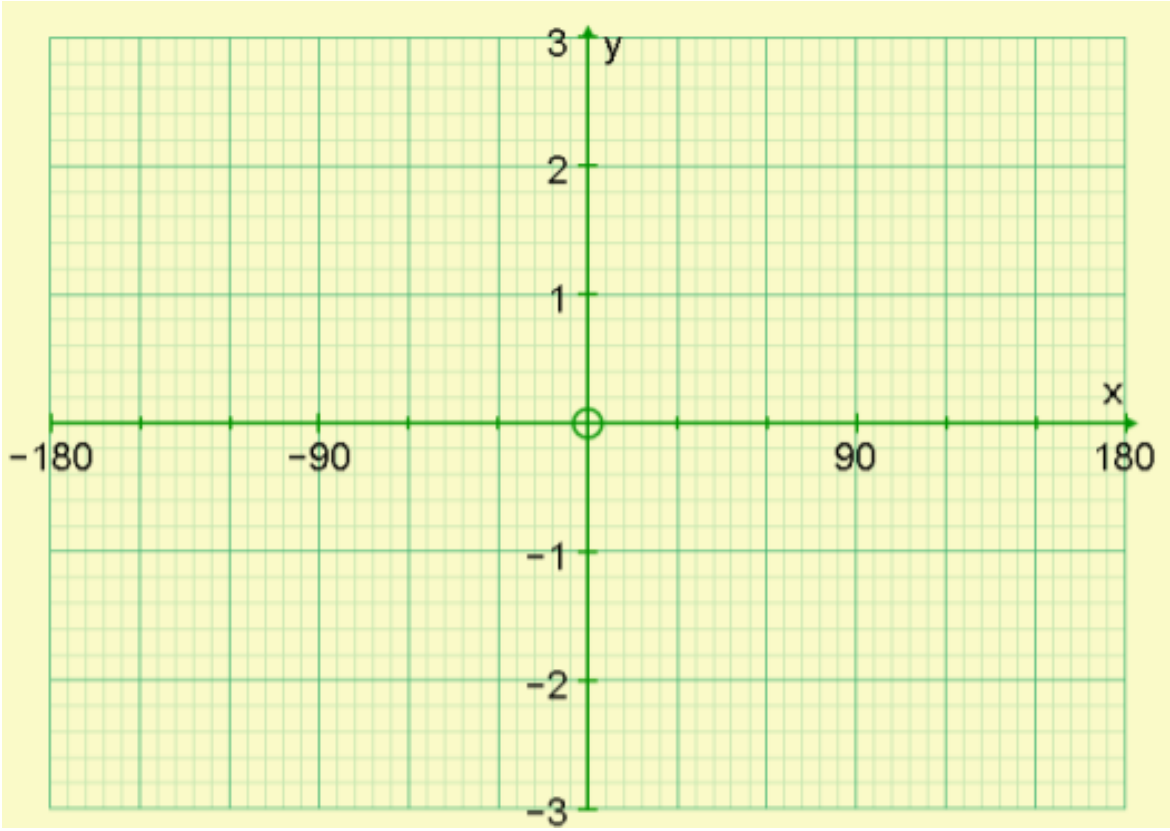
- $\sec\theta = \dfrac{1}{\cos\theta}$
- $\operatorname{cosec}\theta = \dfrac{1}{\sin\theta}$
- $\cot\theta = \dfrac{1}{\tan\theta}$

These are often written and pronounced as **sec** θ, **cosec** θ and **cot** θ.


3
y
2
1
x
−360
−270
−180
−90
90
180
270
360
−1
−2
−3
Equation 1: y=secx
Equation 2: y=cosecx
Equation 3: y=cotx

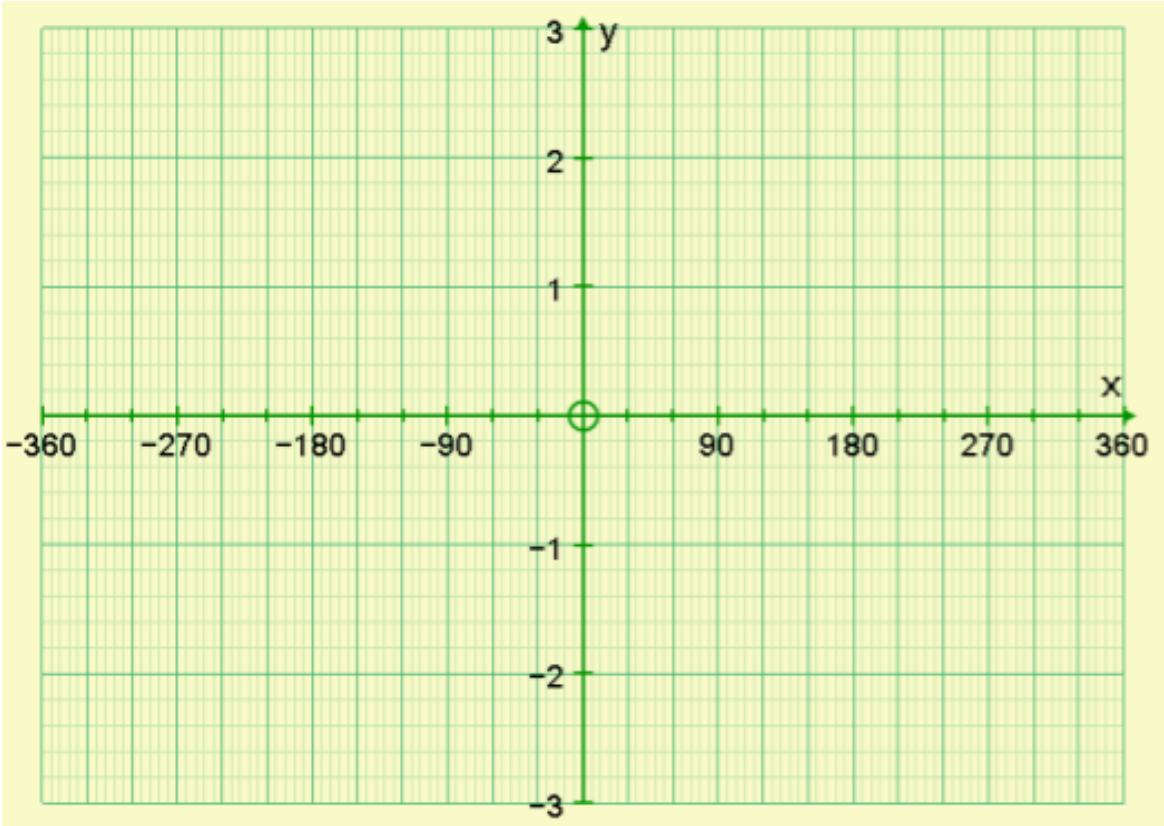
6.2 **You need to know the graphs of sec θ, cosec θ and cot θ.**

Sketch, in the interval $-180° \leqslant \theta \leqslant 180°$, the graph of $y = \sec \theta$.

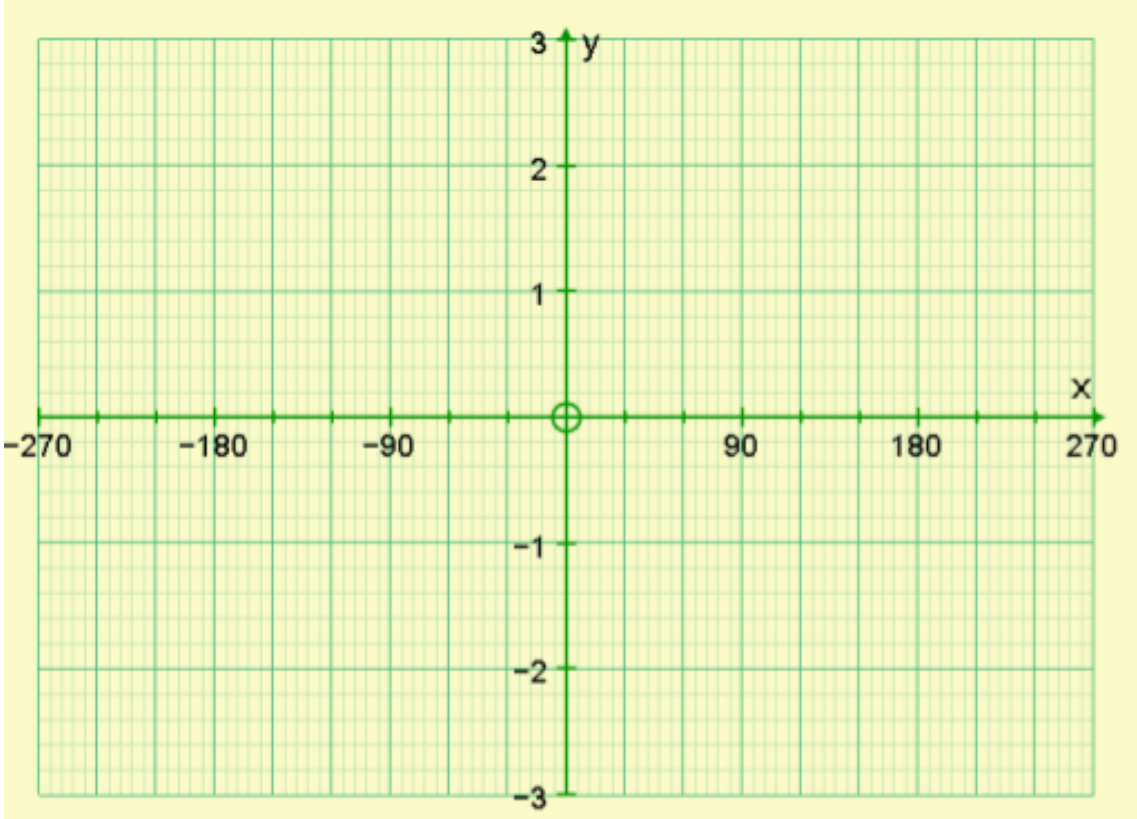


Are there any asymptotes?

Sketch the graph of $y = \text{cosec}\,\theta$.



Sketch the graph of $y = \cot \theta$.



Example 1

Use your calculator to find the value of

(a) sec 100°

(b) cot $(4\pi/3)$

Example 2

Without using your calculator, are the following positive or negative?

a) sec 280°

b) cot 115°

Example 3

Without using a calculator, work out the **exact** values of:

a) $\cot 135^\circ$

b) $\cot (4\pi/3)$

Classwork and Homework

Ex 6A Q1, 2, 3

Ex 6B Q3, 6, 8