

- 1 If $\sec \theta = 2$ and $\sin \theta$ is negative, then what is $\tan \theta$? (Show at least one intermediate step, such as a relevant diagram, equation, or numerical calculation.)

Since $\sec \theta$ is the reciprocal of $\cos \theta$, $\cos \theta = 1/2$. Since $\sin \theta$ is negative,

$$\sin \theta = -\sqrt{1 - (\cos \theta)^2} = -\sqrt{1 - \left(\frac{1}{2}\right)^2} = -\sqrt{\frac{3}{4}} = -\frac{\sqrt{3}}{2}.$$

Therefore,

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\sqrt{3}/2}{1/2} = -\sqrt{3}.$$

- 2 Let θ be an angle at the origin from the positive horizontal axis to the ray through $(3, -4)$. What is $\sin \theta$? (Show at least one intermediate step, such as a relevant diagram, equation, or numerical calculation.)

The radius of the circle through that point centred at the origin is

$$\sqrt{(3)^2 + (-4)^2} = \sqrt{25} = 5,$$

so

$$\sin \theta = \frac{-4}{5} = -\frac{4}{5}.$$

- 3 Give a number t such that $\sec t$ is undefined.

The secant function is defined everywhere except at odd multiples of $\pi/2$, so the simplest answer is simply

$$t = \frac{\pi}{2}$$

itself.

- 4 **Extra credit:** Give the range of the cosecant function in interval notation.

The cosecant function can take any value except those strictly between -1 and 1 , so its range is

$$(-\infty, -1] \cup [1, \infty).$$