

Section 1: Polar coordinates and curves

Exercise level 1

- Find the polar coordinates of the following points.
 - (4, 4)
 - $(1, \sqrt{3})$
 - (-3, 4)
 - (-5, -12)
- Find the Cartesian coordinates of the following points.
 - $(4, \frac{\pi}{3})$
 - $(5, \frac{\pi}{2})$
 - $(8, \frac{5\pi}{4})$
 - $(6, \frac{11\pi}{6})$
- Sketch the following polar curves for $0 \leq \theta \leq 2\pi$.
Use solid lines for $r > 0$ and broken lines for $r < 0$.
 - $r = \sin 2\theta$
 - $r = \cos 4\theta$
 - $r = 1 + \cos \theta$
 - $r = 1 + 2 \cos \theta$
 - $r = 3 + 2 \sin \theta$
- Sketch, on separate diagrams, the curve $r = \cos 3\theta$
 - for the domain $0 \leq \theta \leq \pi$
 - for the domain $-\frac{1}{2}\pi \leq \theta \leq \frac{1}{2}\pi$Use solid lines for $r > 0$ and broken lines for $r < 0$.
Explain the differences between the two curves.
- Write the following polar equations in Cartesian form.
 - $r = \cos \theta$
 - $r = \sin 2\theta$
 - $r = 1 + \cos \theta$
 - $r = \sec(\theta - \frac{\pi}{6})$
- Write the following Cartesian equations in polar form.
 - $y = x^2$
 - $(x-1)^2 + y^2 = 5$
 - $xy = 1$
 - $(x^2 + y^2)^2 = x^2 - y^2$