

# Polar coordinates \*

Dr Juan H Kloppe

## Contents

1 Polar and rectangular coordinates	1
-------------------------------------	---

## 1 Polar and rectangular coordinates

**Definition 1.1.** Any point,  $P$ , in the plane is defined by a pair of real numbers  $x$  and  $y$ . We state  $P(x, y)$ . This is the rectangular coordinates of a point.

**Definition 1.2.** The rectangular coordinates of any point in the plane can be expressed in polar form,  $P(r, \theta)$ , where  $r$  is the radius from the origin to the point and  $\theta$  is the angle that the radius makes with the positive  $x$  (or in this case the polar) axis. Note that there are an infinite number of angles for each radius, as we can express the angle as  $\theta + 2\pi n$ , where  $n \in \mathbb{N}$ .

**Definition 1.3.** Given a point,  $P(x, y)$  in rectangular coordinates, the equations for conversion to polar coordinates are shown in (1)

$$P(r, \theta) = P\left(\sqrt{x^2 + y^2}, \tan^{-1} \frac{y}{x}\right) \quad (1)$$

**Definition 1.4.** Given a point,  $P(r, \theta)$ , in polar coordinates, the equations for conversion to rectangular coordinates are shown in (2).

$$P(x, y) = P(r \cos \theta, r \sin \theta) \quad (2)$$

---

\*A course in vector calculus