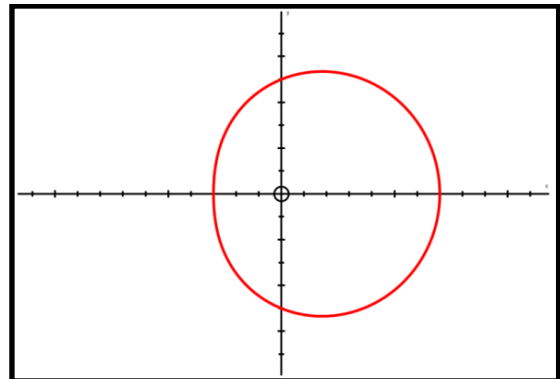
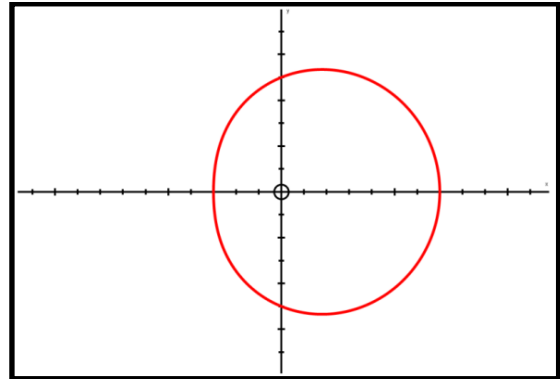


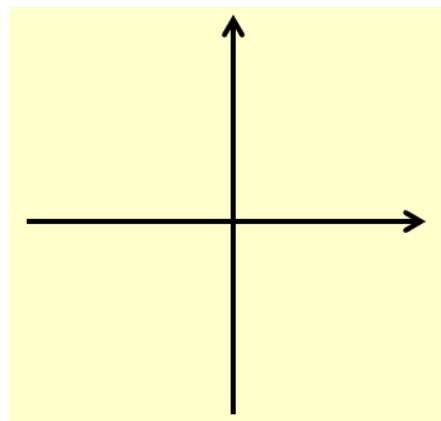
## 5D Tangents to Polar Curves



1. Find the coordinates of the points on:

$$r = a(1 + \cos\theta)$$

Where the tangents are parallel to the initial line  $\theta = 0$ .





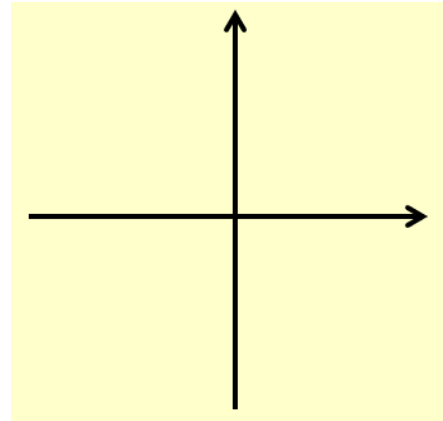
2. Find the coordinates and the equations of the tangents to the curve:

$$r = a \sin 2\theta, \quad 0 \leq \theta \leq \pi/2$$

Where the tangents are:

a) Parallel to the initial line

Give answers to 3 s.f where appropriate:



b) Perpendicular to the initial line

Give answers to 3 s.f where appropriate:

3. Prove that for:

$$r = (p + q\cos\theta), \quad p \text{ and } q \text{ both } > 0 \text{ and } p \geq q$$

to have a 'dimple',  $p < 2q$  and also

$$p \geq q.$$

