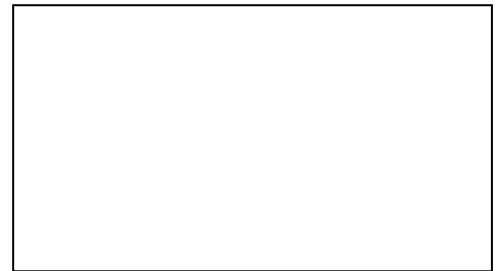


Sketching Curves of Polar Equations

How would you sketch each of the following? (Listed on specification)

Summary

1. $r = a$



2. $\theta = \alpha$



3. $r = a\theta$



Sketching Using a Table of Values

Use the table to sketch the graph of $r = a(1 + \cos \theta)$

θ	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
r					

(NB: Negative values of r are discounted in Edexcel CP2)

Examples:

1. $r = \sin 3\theta$

2. $r^2 = a^2 \cos 2\theta$

Investigate these:

1. $r = 2\sin\theta$

4. $r = 3\cos 4\theta$

2. $r = 2\cos\theta$

5. $r = 4\sin\theta$

3. $r = 3\sin 4\theta$

6. $r = 4\cos\theta$

Observations:

Egg or Dimple? $r = a(p + q \cos \theta)$

Polar graphs of the form $r = \pm p \pm q \cos \theta$ or $r = \pm p \pm q \sin \theta$ with $p, q > 0$ are known as limaçons.

The ratio $\frac{p}{q}$ tells us about the general shape of the limaçon.

For CP2 we are required to sketch limaçons of the $r = a(p + q \cos \theta)$ and $r = a(1 \pm \cos \theta)$. Since we require $r > 0$ we need only situations where $p \geq q$.

Case 1: $p = q$

Case 2: $p > 2q$

Case 3: $q < p < 2q$

Case 4: (not required but interesting!) $p < q$

Examples:

1. Sketch $r = a(5 + 2 \cos \theta)$

2. Sketch $r = a(3 + 2 \cos \theta)$

3. (a) Show on an Argand diagram the locus of points given by the values of z satisfying $|z - 3 - 4i| = 5$

(b) Show that this locus of points can be represented by the polar curve

$$r = 6 \cos \theta + 8 \sin \theta$$