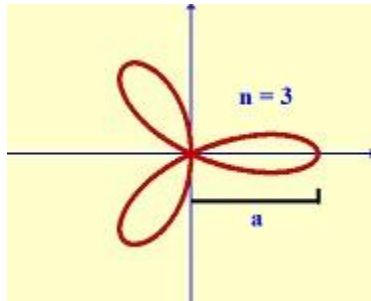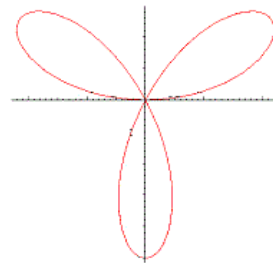# Some Interesting Polar Curves

I. Rose curves
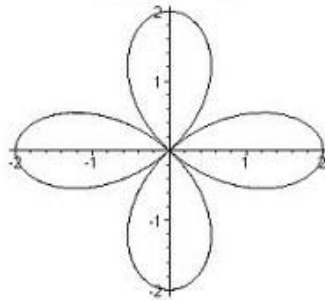
1. Equation: $r = a\sin(n\theta)$ or $r = a\cos(n\theta)$

2. Number of petals $= \begin{cases} n & \text{if } n \text{ is an odd integer} \\ 2n & \text{if } n \text{ is an even integer} \end{cases}$
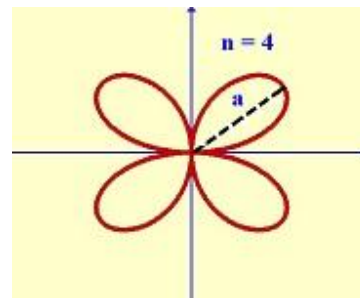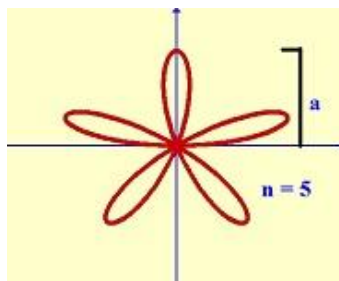
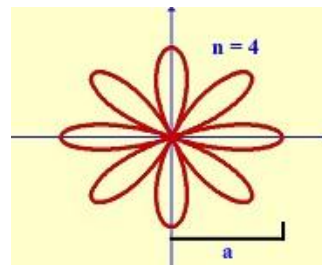3. Examples:

$r = a\cos 3\theta$

$r = a\sin 3\theta$
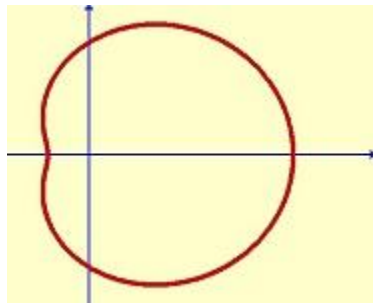

$r = a\cos 2\theta$
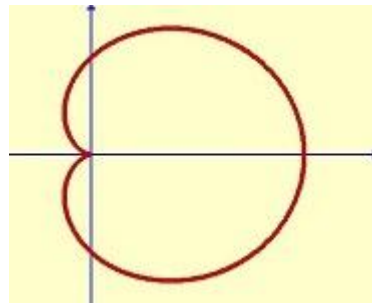

$r = a\sin 2\theta$

$r = a\sin 5\theta$

$r = a\cos 4\theta$

II. Limaçons

    1. Equation: $r = a \pm b\sin\theta$ or $r = a \pm \cos\theta$

    2. If a = b, Then it is a cardioid (heart-shape)
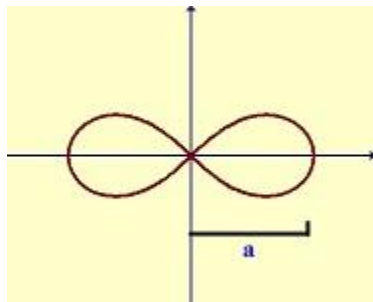
    3. Examples:

$r = 3 + 2\cos\theta$ $r = a + a\cos\theta$

III. Lemniscates

    1. Equation: $r^2 = a^2 \sin 2\theta$ or $r^2 = a^2 \cos 2\theta$

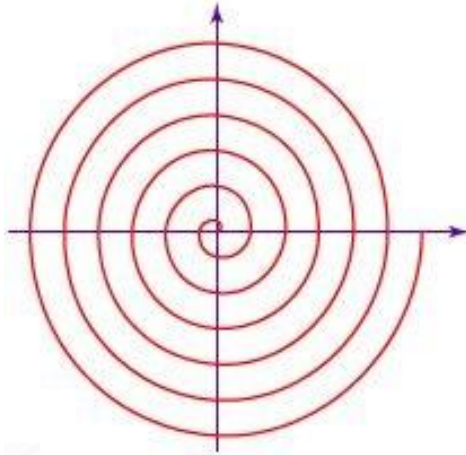   2. Loci have the appearance of figure eights.

    3. Example:

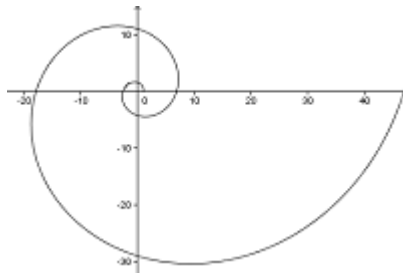$r^2 = a^2 \cos 2\theta$

IV. Spirals

    1. Spiral of Archimedes   r=kθ

    2. Logarithmic Spiral $\log_b r = \log_b a + k\theta$ or $r = a \bullet b^{k\theta}$

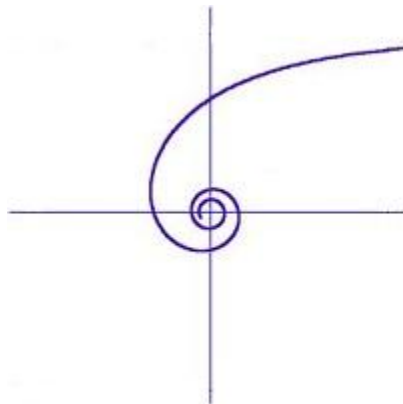   3. Hyperbolic Spiral $r\theta = a$

4. Examples

$$r = k\theta$$

$$r = a \bullet b^{k\theta}$$

$$r\theta = k$$