(38)   11.3 Graph in Polar Coordinates

(3) Loved Rose

|	
$r^2 = a^2 \sin 2\theta$, $\quad r = a \sin 2\theta$, $\quad r = a \sin 3\theta$ $r^2 = a^2 \cos 2\theta$, $\quad r = a \cos 2\theta$, $\quad r = a \cos 3\theta$	
  $r^2 = a^2 \sin 2\theta$ OR $r = a\sqrt{\sin 2\theta}$	 $r^2 = a^2 \cos 2\theta$ OR $r = a\sqrt{\cos 2\theta}$
  $r = a \sin 2\theta$	 $r = a \cos 2\theta$
  $r = a \sin 3\theta$	 $r = a \cos 3\theta$
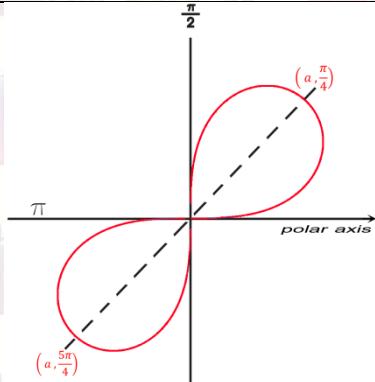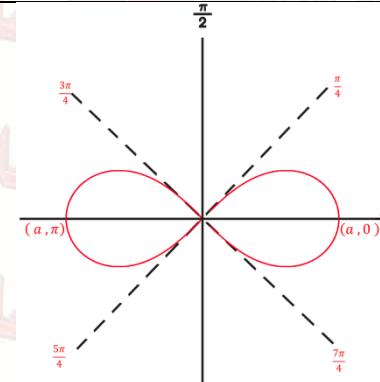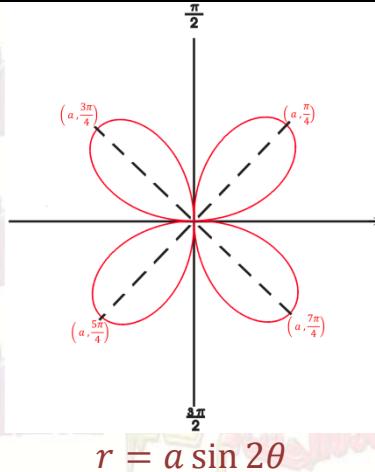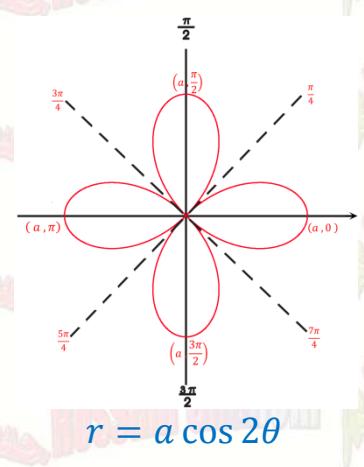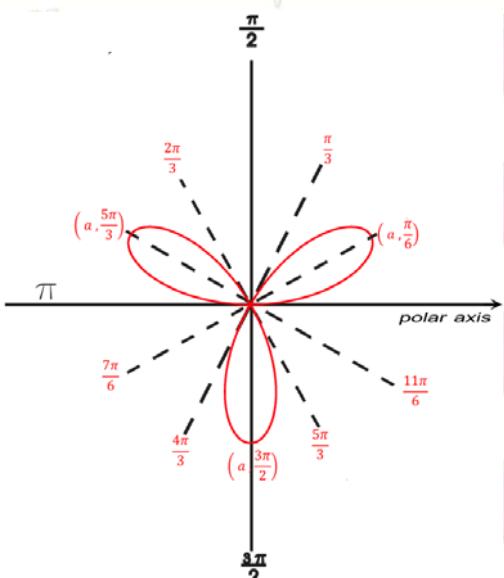
(4) Cardioid

$$r = 1 + \sin \theta \quad , \quad r = 1 - \sin \theta \quad , \quad r = a + a \sin \theta \quad , \quad r = a - a \sin \theta$$

$$r = 1 + \cos \theta \quad , \quad r = 1 - \cos \theta \quad , \quad r = a + a \cos \theta \quad , \quad r = a - a \cos \theta$$

$r = 1 + \sin \theta$

$r = a + a \sin \theta$

$r = 1 - \sin \theta$

$r = 1 + \cos \theta$

إشارة $\cos \theta , \sin \theta$ تؤثر في موضع المنحنى

$r = a - a \sin \theta$

$r = a + a \cos \theta$

$r = 1 - \cos \theta$

$r = a - a \cos \theta$

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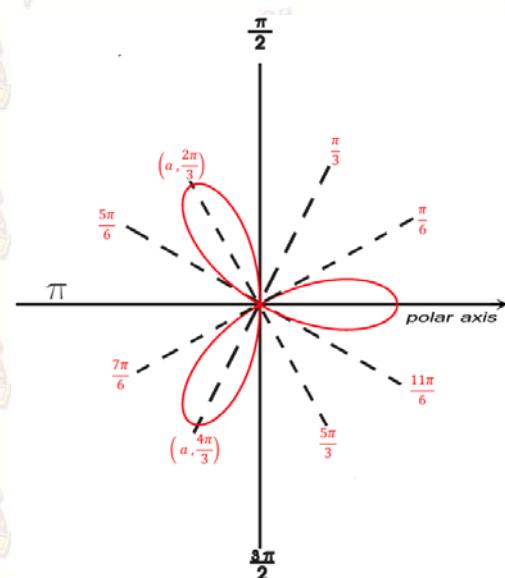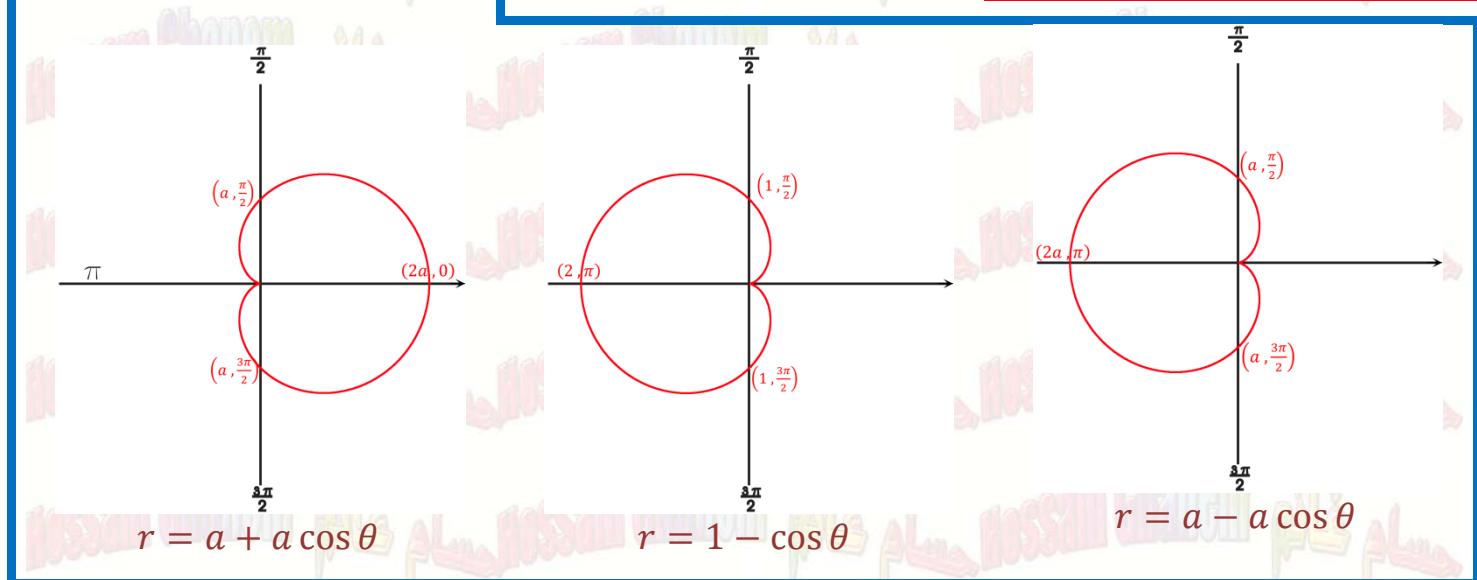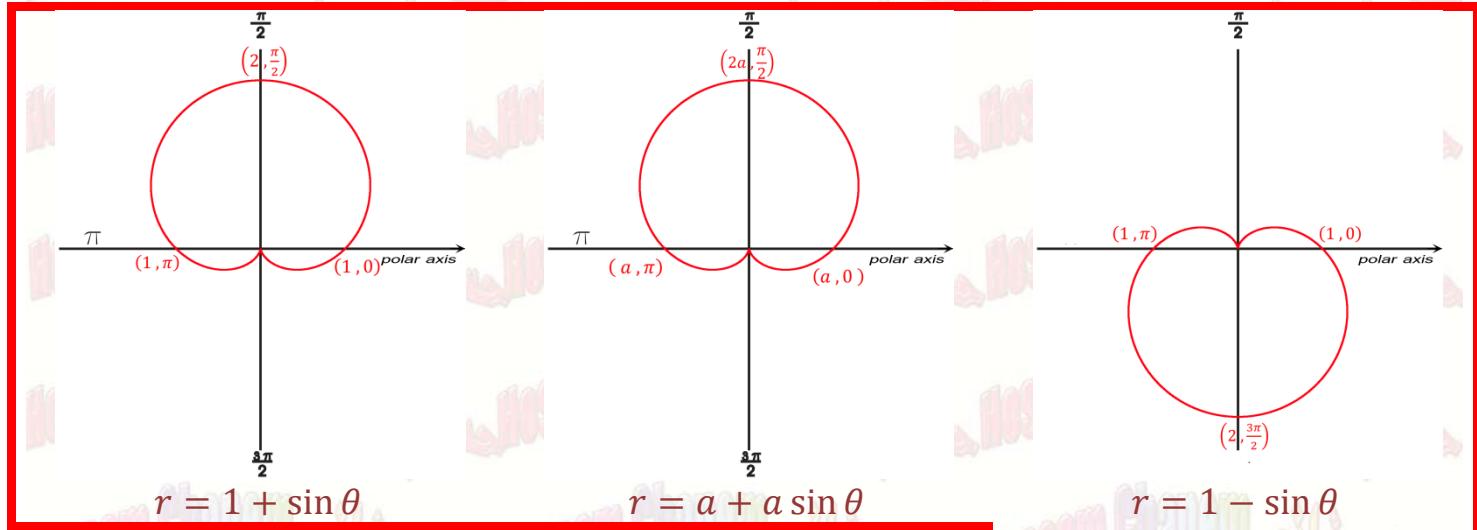
(5) Limacons

$\boxed{Dimple}$: $\frac{a}{b} < 2$ $r = 4 + 3\sin\theta$, $r = 7 - 5\cos\theta$, $r = a + b\sin\theta$, $r = a - b\cos\theta$

$\boxed{Oval}$: $\frac{a}{b} > 2$ $r = 6 + 2\cos\theta$, $r = 8 - 3\sin\theta$, $r = a + b\cos\theta$, $r = a - b\sin\theta$
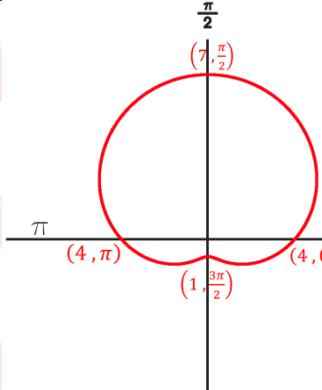
$r = r = 4 + 3\sin\theta$ $r = 7 - 5\cos\theta$ $r = a + b\sin\theta$

Dimple $\frac{a}{b} < 2$

$r = 6 + 2\cos\theta$

إشارة $\cos\theta$, $\sin\theta$
تؤثر في موضع المنحنى

Oval $\frac{a}{b} > 2$

$r = a - b\cos\theta$

$r = 8 - 3\sin\theta$ $r = a + b\cos\theta$ $r = a - b\sin\theta$

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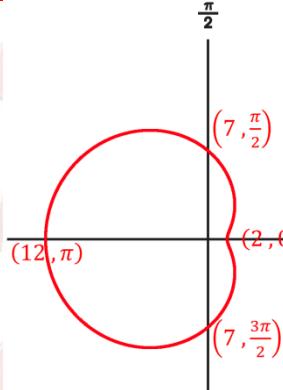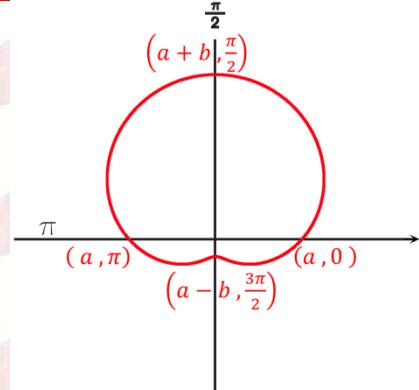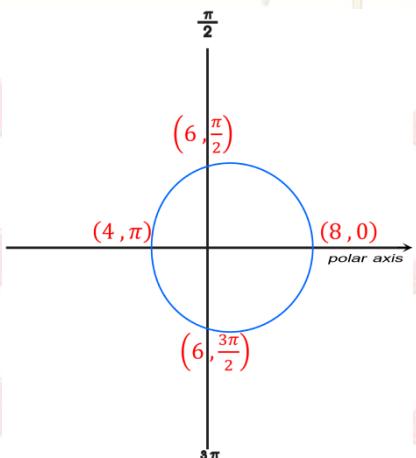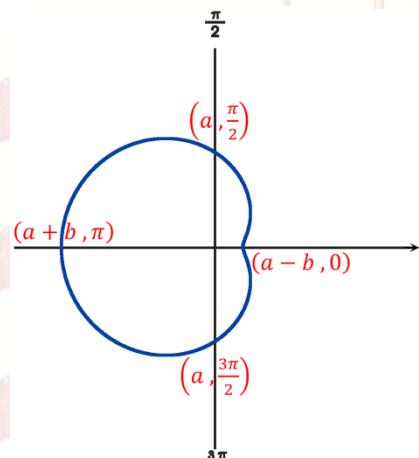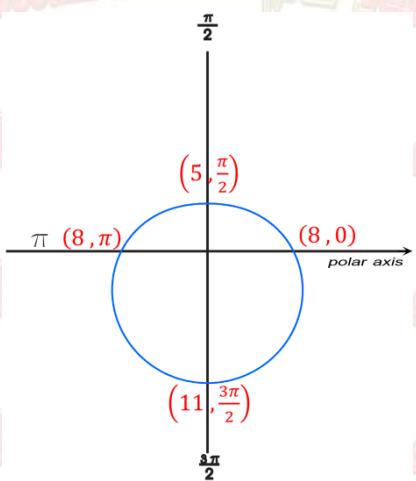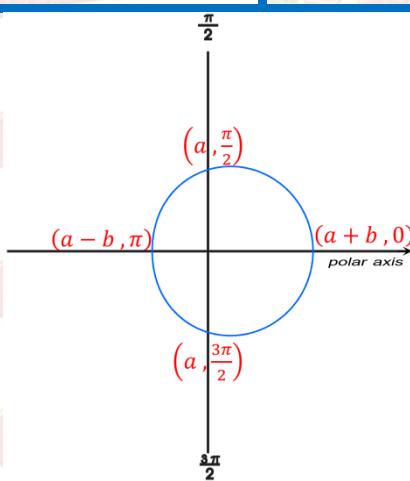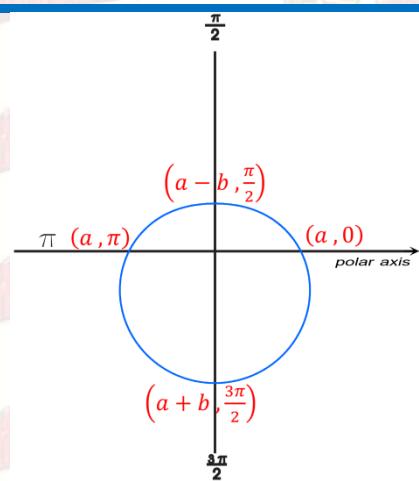
Example 1   Sketch the graph of the equation $r = 2 + 2\sin\theta$

Solution

$\frac{\pi}{2}$

$\left(4, \frac{\pi}{2}\right)$

$(2, \pi)$

$\frac{3\pi}{2}$

polar axis

$(2, 0)$

Example 2   Sketch the graph of the equation $r = 3\left(1 - \sin\theta\right)$

$\frac{\pi}{2}$ Solution

3   3

6

Example 3   Sketch And name the graph of the equation $r = 4(1 + \cos\theta)$

Solution

$\frac{\pi}{2}$

4

π

8

4

$\frac{3\pi}{2}$

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Example 4   Sketch the graph of the equation $r = 3 - 3\cos\theta$

Solution

$\frac{\pi}{2}$

3

6

3

$\frac{3\pi}{2}$
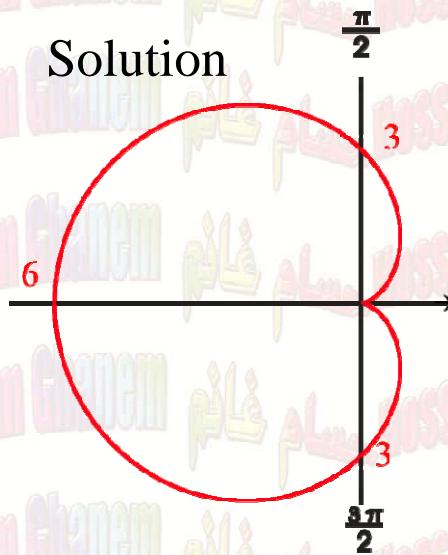
Example 5   Sketch the graph of the equation $r = 5 - 3\sin\theta$

Solution

5   2   5

8
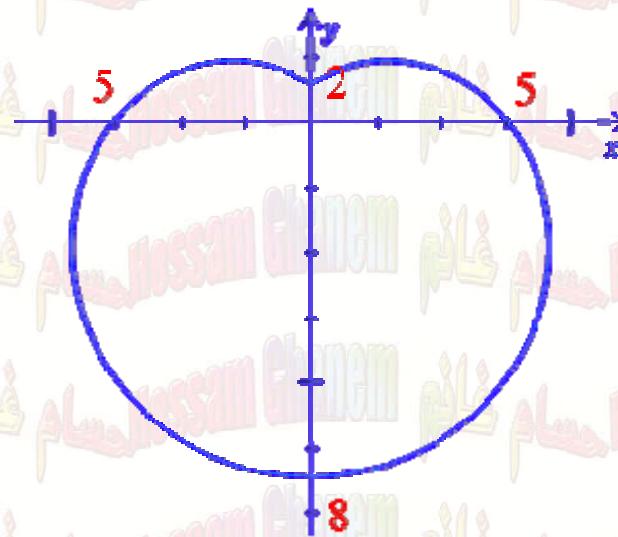
Example 6   Sketch the graph of the equation $r = 7 - 2\sin\theta$

Solution

5

7   7

9

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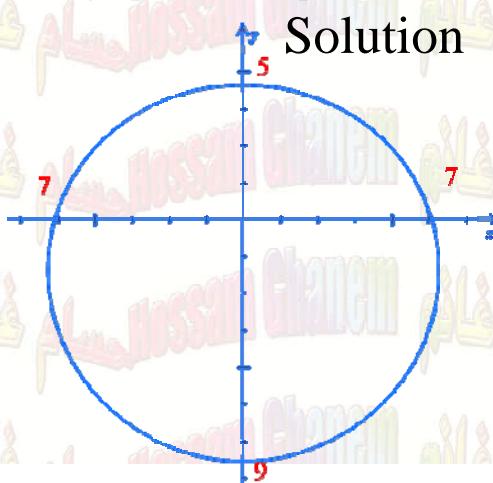
Example 7   Sketch the graph of the equation $r = 9 - 2\cos\theta$

Solution

9

11   7

9
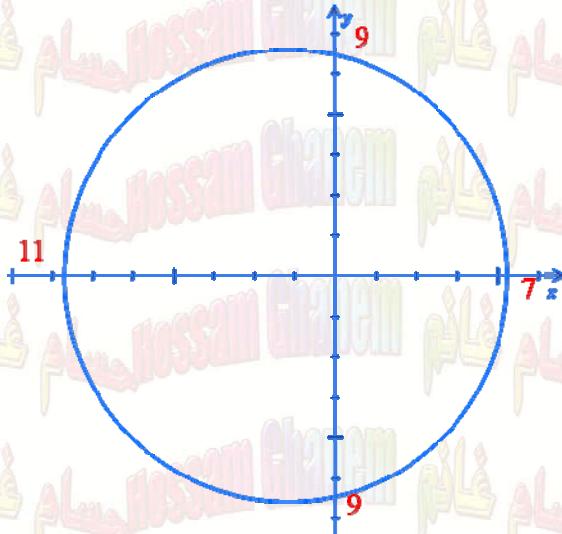
Example 8   Sketch the graph of the equation $r = 5 + 3\cos\theta$

Solution

5

2   8

5
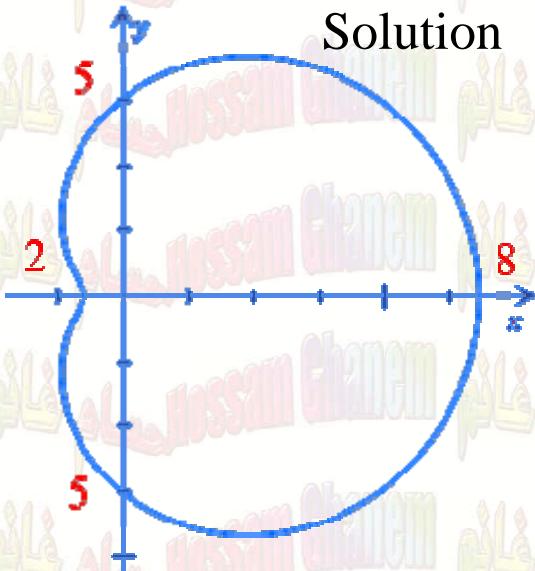
Example 9   Sketch And name the graph of the equation $r = 3\sin 2\theta$

Solution

$\frac{\pi}{2}$

$\left(3,\frac{3\pi}{4}\right)$ $\left(3,\frac{\pi}{4}\right)$

$\left(3,\frac{5\pi}{4}\right)$ $\left(3,\frac{7\pi}{4}\right)$

$\frac{3\pi}{2}$

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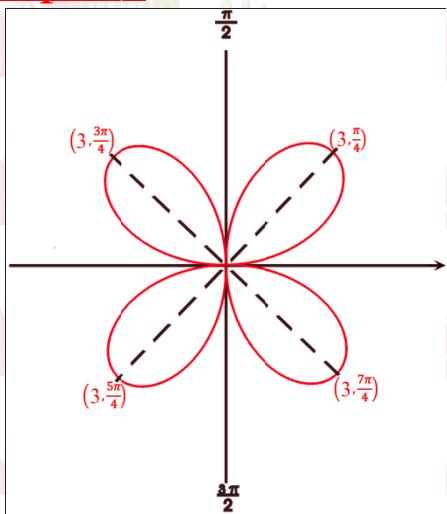
Example 10   Sketch the graph of the equation $r = 4\cos 3\theta$

Solution
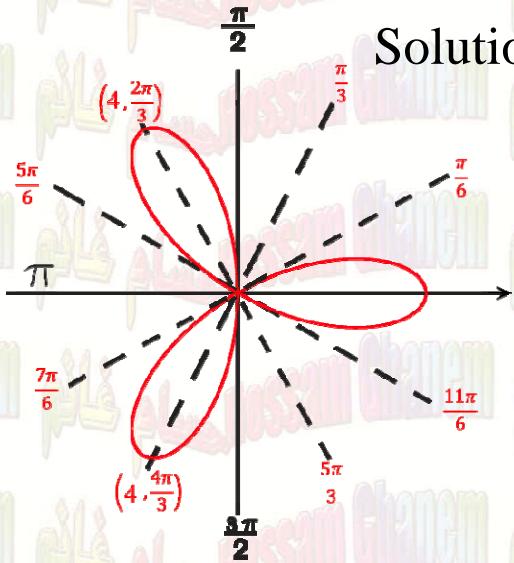
Example 11   Sketch the graph of the equation $r = 4\sqrt{\cos(2\theta)}$

Solution
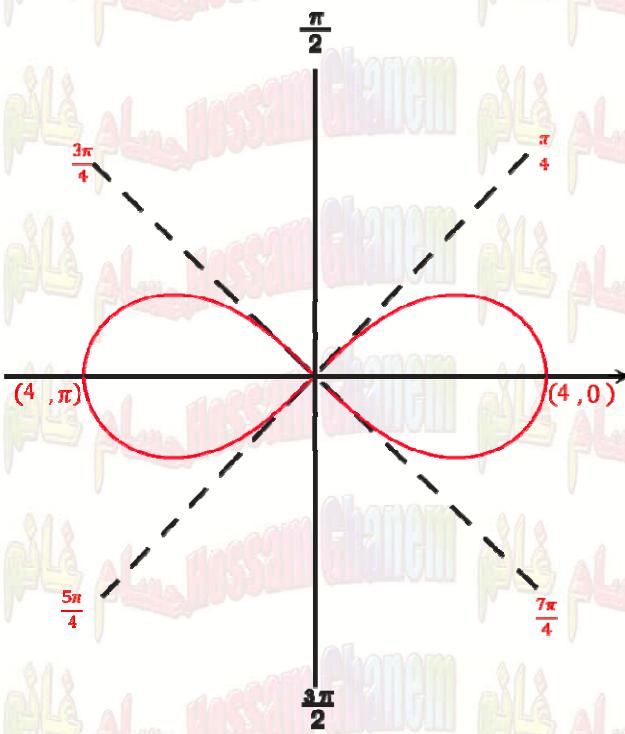
Homework

Sketch And name the graph of the equation

1	$r = a(1 + \sin\theta)$	11	$r = 3(1 + \cos\theta)$	21	$r = a \pm b\cos\theta$
2	$r = 1 + \sin\theta$	12	$r = 5 + 5\cos\theta$	22	$r = 5 + 3\cos\theta$
3	$r = 4(1 + \sin\theta)$	13	$r = a(1 - \cos\theta)$	23	$r = 3 - 2\cos\theta$
4	$r = a(1 - \sin\theta)$	14	$r = 1 - \cos\theta$	24	$r = a\sin n\theta$
5	$r = 1 - \sin\theta$	15	$r = 2(1 - \cos\theta)$	25	$r = 5\sin 3\theta$
6	$r = 2 - 2\sin\theta$	16	$r = 4 - 4\cos\theta$	26	$r = a\cos n\theta$
7	$r = 4 - 4\sin\theta$	17	$r = 5(1 - \cos\theta)$	27	$r = 2\cos 2\theta$
8	$r = a(1 + \cos\theta)$	18	$r = a \pm b\sin\theta$	28	$r = a\sqrt{\cos(2\theta)}$
9	$r = 1 + \cos\theta$	19	$r = 6 + 4\sin\theta$	29	$r^2 = 3\sqrt{\cos(2\theta)}$
10	$r = 2 + 2\cos\theta$	20	$r = 9 - 3\sin\theta$		

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