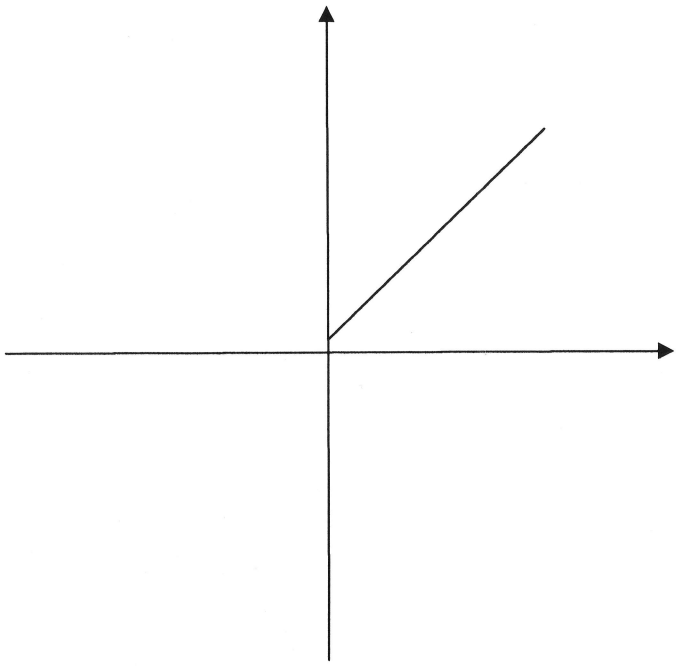
8.2: Polar Equations and Graphs

Symmetry



1) Origin 2) x-axis 3) y-axis

EX: Check symmetry for the following polar equations.

1) $r = 4\sin\theta$, 2) $r = 6 + 4\cos\theta$, 3) $r = 2 - 3\sin\theta$
4) $r = 2\sin 2\theta$, 5) $r = 2\cos 3\theta$, 6) $r = 4\cos\theta$

EX: Graph
1) $r = 2\cos\theta$, 2) $r = 2\sin\theta$, 3) $r = -\cos\theta$, 4) $r = -\sin\theta$

Polar Graphs

Notes:

1) **Cardioid** $r = a \pm b\sin\theta$ and $r = a \pm b\cos\theta$, $(a = b) > 0$

2) **Limacon (without inner circle)** $r = a \pm b\sin\theta$ and $r = a \pm b\cos\theta$, $a > b > 0$

3) **Limacon (with inner circle)** $r = a \pm b\sin\theta$ and $r = a \pm b\cos\theta$, $b > a > 0$

EX: Graph

1) $r = 2 - 3\sin\theta$, 2) $r = 2(1 - \cos\theta)$, 3) $r = 6 + 4\cos\theta$

EX: Graph

1) $r = \cos 3\theta$, 2) $r = \sin 3\theta$, 3) $r = 2\sin 2\theta$, 4) $r = \cos 2\theta$

EX: Graph

1) $r\cos\theta = -2$, 2) $\theta = \frac{\pi}{4}$, 3) $r = 2$

4) $r = \theta$, $\theta \geq 0$, 5) $r = -\theta$, $\theta \leq 0$

EX: Select all the equations which are limacon with inner circles.

a) $r = \sin\theta - 1$

b) $r\cos\theta = 2$

c) $r - \cos\theta = -2$

d) $r + 1 = 2\sin\theta$

e) $r(\sin\theta + \cos\theta) = 3$

EX: Select all the equations which are lines.

a) $r = -5\csc\theta$

b) $2\cos\theta - \sin\theta = \dfrac{1}{r}$

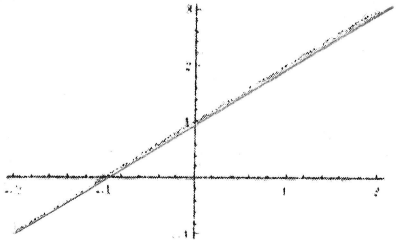
c) $2r = \theta$

d) $\dfrac{1}{2}r = 3$

e) $r - 4\cos\theta = 0$

EX:

Select the formula for the following polar graph



(a) $r(2\sin\theta - 2\cos\theta) = 2$

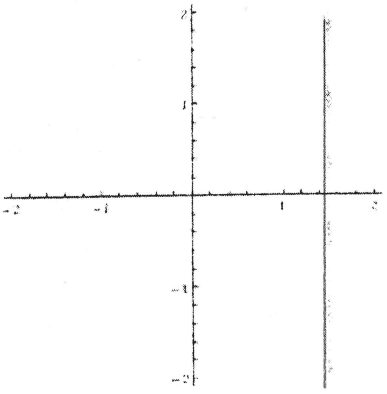
(b) $\theta = 2$

(c) $r = 2\sin\theta$

(d) $r = 2\sin\theta - 2\cos\theta$

EX:

Select the formula for the following polar graph



(a) $r(\cos\theta + \sin\theta) = \dfrac{3}{2}$

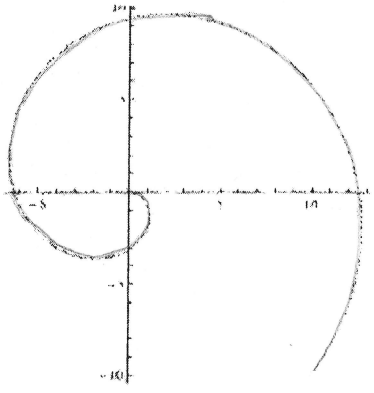
(b) $r = \dfrac{3}{2}\csc\theta$

(c) $r = \dfrac{3}{2}\sec\theta$

(d) $r\sec\theta = \dfrac{3}{2}$

EX:

Select the formula for the following polar graph



(a) $r = -2\theta, \theta < 0$

(b) $\theta = -\dfrac{2\pi}{3}$

(c) $r = -2$

(d) $r = 2\theta, \theta < 0$