

Polar Equations and Graphs

1. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$r = 5$$

2. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$\theta = \frac{\pi}{4}$$

3. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$r \cos \theta = 3$$

4. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$r \sin \theta = -5$$

5. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$r = 3 \sin \theta$$

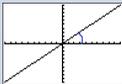
6. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation (Similar to p.325 #13-28)

$$r \sec \theta = 6$$

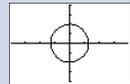
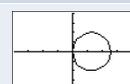
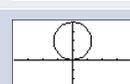
Symmetry

Symmetry	Condition
Polar axis (x-axis)	Replace θ by $-\theta$ and you get the same equation
Line $\theta/2$ (y-axis)	Replace θ by $\pi - \theta$ and you get the same equation
Pole (origin)	Replace r by $-r$ or θ by $\theta + \pi$ and you get the same equation

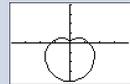
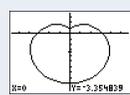
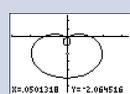
Graph Forms

$\theta = \alpha$ (Line at angle α)	
$r \cos \theta = a$ (Vertical Line)	
$r \sin \theta = a$ (Horizontal Line)	

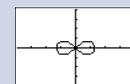
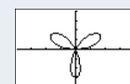
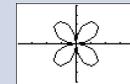
Graph Forms

$r = a$ ($a > 0$) (Circle)	
$r = \pm 2a \cos \theta$ ($a > 0$) (Circle)	
$r = \pm 2a \sin \theta$ ($a > 0$) (Circle)	

Graph Forms

$r = a \pm a \cos \theta$ $r = a \pm a \sin \theta$ ($a > 0$) (Cardioid)	
$r = a \pm b \cos \theta$ $r = a \pm b \sin \theta$ ($0 < b < a$) (Limacon without inner loop)	
$r = a \pm b \cos \theta$ $r = a \pm b \sin \theta$ ($0 < a < b$) (Limacon with inner loop)	

Graph Forms

$r^2 = a^2 \cos(2\theta)$ $r^2 = a^2 \sin(2\theta)$ ($a > 0$) (Lemniscate)	
$r = a \sin(3\theta)$ $r = a \cos(3\theta)$ ($a > 0$) (Rose with 3 Petals)	
$r = a \sin(2\theta)$ $r = a \cos(2\theta)$ ($a > 0$) (Rose with 4 Petals)	

$$\begin{aligned} \cos(\alpha + \beta) &= \cos \alpha \cos \beta - \sin \alpha \sin \beta & \cos(\alpha - \beta) &= \cos \alpha \cos \beta + \sin \alpha \sin \beta \\ \sin(\alpha + \beta) &= \sin \alpha \cos \beta + \cos \alpha \sin \beta & \sin(\alpha - \beta) &= \sin \alpha \cos \beta - \cos \alpha \sin \beta \\ \tan(\alpha + \beta) &= \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta} & \tan(\alpha - \beta) &= \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta} \end{aligned}$$

7. Identify and graph each polar equation
(Similar to p.326 #37-60)

$$r = 2 + 2 \sin \theta$$

8. Identify and graph each polar equation
(Similar to p.326 #37-60)

$$r = 4 \sin(3\theta)$$

9. Identify and graph each polar equation
(Similar to p.326 #37-60)

$$r = 2 \cos(2\theta)$$

10. Identify and graph each polar equation
(Similar to p.326 #37-60)

$$r^2 = 4 \cos(2\theta)$$