

Instructions: Show all work. Use exact answers unless specifically asked to round. Answer all parts of each question.

1. Convert the equation $x^2 = 6y$ into polar coordinates and solve for r .

$$r^2 \cos^2 \theta = 6r \sin \theta$$

$$r \cos^2 \theta = 6 \sin \theta$$

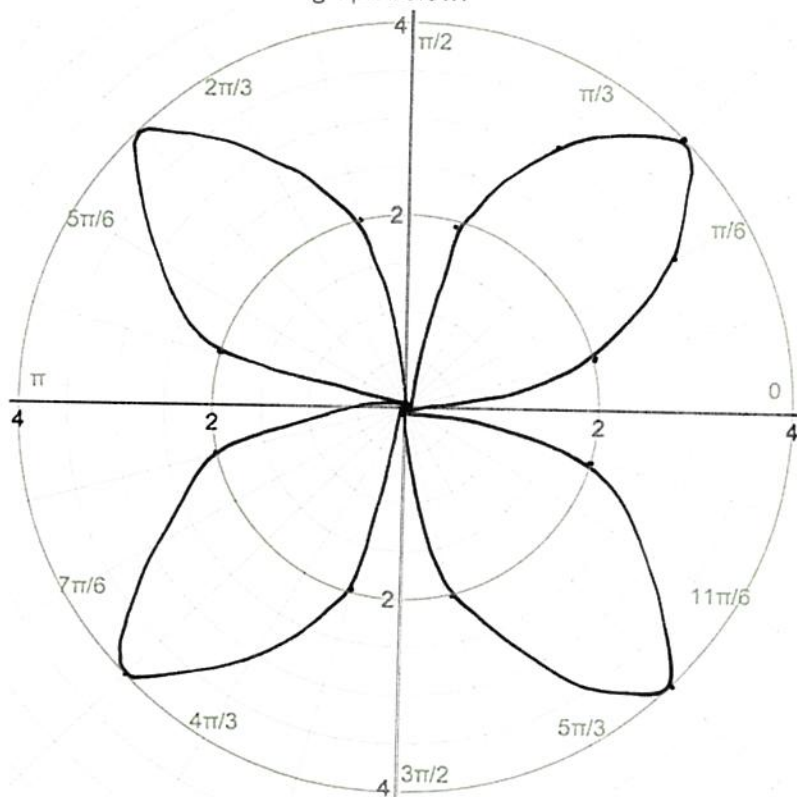
$$r = 6 \frac{\sin \theta}{\cos^2 \theta} \cdot \frac{1}{\cos \theta} = 6 \tan \theta \sec \theta$$

2. Convert the equation $r = 8 \cos \theta + 2 \sin \theta$ into rectangular coordinates.

$$r^2 = 8r \cos \theta + 2r \sin \theta$$

$$x^2 + y^2 = 8x + 2y$$

3. Plot $r = 4 \sin 2\theta$ on the graph below.



4. Write $z = 1 + i$ in polar form.

$$|z| = r = \sqrt{1^2 + 1^2} = \sqrt{2}$$

$$\theta = \pi/4$$

$$z = \sqrt{2} e^{i\pi/4}$$

5. Write $z = 2e^{i(\frac{3\pi}{4})}$ in standard form.

$$2 \left(\cos 3\pi/4 + i \sin 3\pi/4 \right)$$

$$2 \left(\frac{\sqrt{2}}{2} + i \left(-\frac{\sqrt{2}}{2} \right) \right) =$$

$$\sqrt{2} - \sqrt{2}i$$