Precalculus

Topic: Graphs of Polar Equations

Instructions

Solve the following problems related to graphs of polar equations. Show all work clearly and check your solutions.

Practice Problems

1. **Test the Polar Equation for Symmetry with Respect to the Polar Axis, the Pole, and the Line $\theta = \frac{\pi}{2}$**

   (i) $r = 2 - \sin\theta$
   (ii) $r = 3\sec\theta$
   (iii) $r = 4$
   (iv) $r = 5\cos\theta$
   (v) $r = 3\sin\theta$
   (vi) $r = 5\cos\csc\theta$
   (vii) $r = 5\sin\theta$
   (viii) $r = 1 + 3\cos\theta$
   (ix) $r^2 = 4\cos 2\theta$
   (x) $r = 9\sin\theta$

2. **Sketch a Graph of the Polar Equation, and Express the Equation in Rectangular Coordinates**

   (i) $r = 2$
   (ii) $r = -\frac{\pi}{2}$
   (iii) $r = \frac{5\pi}{6}$
   (iv) $r = 6\cos\theta$
   (v) $r = \cos\theta$
   (vi) $r = 2 + 3\sin\theta$
   (vii) $r = 3(1 + \sin\theta)$
   (viii) $r = 2\cos 2\theta$
   (ix) $r = 2\cos 2\theta$
   (x) $r = \cos 2\theta$

3. **Sketch a Graph of the Polar Equation**

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

(ii) $r = 2\sin\theta + 2\cos\theta$

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

(iv) $r = 2\sin\theta + \cos\theta$

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

(vi) $r = 2 + \sin\theta$

(vii) $r = 3\cos\theta$

(viii) $r = 4$

4. **Use a Graphing Device to Graph the Polar Equation. Choose the Domain of θ to Make Sure You Produce the Entire Graph.**

(i) $r = \cos\left(\frac{\theta}{2}\right)$

(ii) $r = \sin\left(\frac{8\theta}{5}\right)$

(iii) $r = 1 + 2\sin\left(\frac{\theta}{2}\right)$

(iv) $r = \sqrt{1 - 0.8\sin^2\theta}$

Multiple Chioce Questions

(1) What is the graph of $r = 2$?

A. A circle with radius 2 centered at the origin

B. A line passing through the origin at $\theta = 0$

C. A line passing through the origin at $\theta = \frac{\pi}{2}$

D. A circle with radius 2 centered at $(2, 0)$

(2) Which polar equation represents a cardioid?

A. $r = 1 + \cos\theta$

B. $r = 1 - \cos\theta$

C. $r = 2 + \cos\theta$

D. $r = 2 - \sin\theta$

(3) What type of graph does the equation $r = 2 + 2\sin\theta$ represent?

A. A limacon

B. A circle

C. A spiral

D. A line

(4) Which of the following polar equations represents a straight line?

A. $r = \cos\theta$

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

C. $r = 2\cos\theta$

D. $r = 1 + \cos\theta$