Polar Equations of Conics

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$r = \frac{ep}{1 - e\cos\theta}$	Directrix is perpendicular to the polar axis at a distance p units to the left of the pole
$r = \frac{ep}{1 + e\cos\theta}$	Directrix is perpendicular to the polar axis at a distance p units to the right of the pole
$r = \frac{ep}{1 + e\sin\theta}$	Directrix is parallel to the polar axis at a distance p units above the pole
$r = \frac{ep}{1 - e\sin\theta}$	Directrix is parallel to the polar axis at a distance p units below the pole

Polar Equations of Conics

Eccentricity

- If e = 1, the conic is a parabola; the axis of symmetry is perpendicular to the directrix
- If e < 1, the conic is an ellipse; the major axis is perpendicular to the directrix
- If e > 1, the conic is a hyperbola; the transverse axis is perpendicular to the directrix

Parabola

$r = \frac{ep}{1 - e\cos\theta}$	Directrix: x = -p Focus: Pole
$r = \frac{ep}{1 + e\cos\theta}$	Directrix: x = p Focus: Pole
$r = \frac{ep}{1 + e\sin\theta}$	Directrix: y = p Focus: Pole
$r = \frac{ep}{1 - e\sin\theta}$	Directrix: y = -p Focus: Pole

Hyperbola

$r = \frac{ep}{1 - e\cos\theta}$	Vertices: Plug in 0 and π for θ Center: Halfway in between the vertices (use midpoint formula) c = distance between center and pole a = c/e $b = \sqrt{c^2 - a^2}$
$r = \frac{ep}{1 + e\cos\theta}$	Vertices: Plug in 0 and π for θ Center: Halfway in between the vertices (use midpoint formula) c = distance between center and pole a = c/e $b = \sqrt{c^2 - a^2}$

Hyperbola (cont.)

$r = \frac{ep}{1 + e\sin\theta}$	Vertices: Plug in π/2 and 3π/2 for θ Center: Halfway in between the vertices (use midpoint formula) c = distance between center and pole a = c/e $b = \sqrt{c^2 - a^2}$
$r = \frac{ep}{1 - e\sin\theta}$	Vertices: Plug in π/2 and 3π/2 for θ Center: Halfway in between the vertices (use midpoint formula) c = distance between center and pole a = c/e $b = \sqrt{c^2 - a^2}$

Ellipse

$r = \dfrac{ep}{1 - e\cos\theta}$	Vertices: Plug in 0 and π for θ Center: Halfway in between the vertices (use midpoint formula) a = distance between center and vertex c = ea $b = \sqrt{a^2 - c^2}$
$r = \dfrac{ep}{1 + e\cos\theta}$	Vertices: Plug in 0 and π for θ Center: Halfway in between the vertices (use midpoint formula) a = distance between center and vertex c = ea $b = \sqrt{a^2 - c^2}$

Ellipse (cont.)

$r = \dfrac{ep}{1 + e\sin\theta}$	Vertices: Plug in π/2 and 3π/2 for θ Center: Halfway in between the vertices (use midpoint formula) a = distance between center and vertex c = ea $b = \sqrt{a^2 - c^2}$
$r = \dfrac{ep}{1 - e\sin\theta}$	Vertices: Plug in π/2 and 3π/2 for θ Center: Halfway in between the vertices (use midpoint formula) a = distance between center and vertex c = ea $b = \sqrt{a^2 - c^2}$

1. Identify the conic that each polar equation represents. Also, give the position of the directrix
(Similar to p.423 #7-12)

$$r = \frac{5}{1 - \sin\theta}$$

2. Identify the conic that each polar equation represents. Also, give the position of the directrix
(Similar to p.423 #7-12)

$$r = \frac{3}{1 - 2\cos\theta}$$

3. Identify the conic that each polar equation represents. Also, give the position of the directrix
(Similar to p.423 #7-12)

$$r = \frac{5}{1 - \frac{1}{2}\cos\theta}$$

4. Graph the equation
(Similar to p.423 #13-24)

$$r = \frac{4}{1 - \sin\theta}$$

5. Graph the equation
(Similar to p.423 #13-24)

$$r = \frac{2}{1 - 2\cos\theta}$$

6. Graph the equation
(Similar to p.423 #13-24)

$$r = \frac{2}{2 - \cos\theta}$$

7. Graph the equation

$$r = \frac{4}{2 + \sin\theta}$$

8. Convert each polar equation to a rectangular equation
(Similar to p.424 #25-36)

$$r = \frac{2}{1 + \sin\theta}$$

9. Convert each polar equation to a rectangular equation
(Similar to p.424 #25-36)

$$r = \frac{6}{2 + 3\cos\theta}$$

10. Convert each polar equation to a rectangular equation
(Similar to p.424 #25-36)

$$r = \frac{6}{2 - \cos\theta}$$