7.7 - Polar Coordinates

Review Problems

1. **Trig functions.** Given \( \cos(\theta) = -\frac{1}{3} \) with \( \pi < \theta \leq \frac{3\pi}{2} \), find:
   
   (a) \( \sin(\theta) \)
   
   (b) \( \tan(\theta) \)
   
   (c) \( \frac{2\sin(\theta) - \csc(\theta)}{\cot(\theta) + \tan(\theta)} \)
   
   (d) \( \sin(2\theta) \)
   
   (e) \( \cos(2\theta) \)

**Basic Knowledge**

2. Convert the given equations in rectangular coordinates to the equations in polar coordinates:
   
   (a) \( x^2 - y^2 = 1 \)
   
   (b) \( y^2 = 2x \)
   
   (c) \( x^2 + y^2 = 7 \)

3. Convert the given equations in polar coordinates to the equations in rectangular coordinates:
   
   (a) \( r = 3 \)
   
   (b) \( \theta = \frac{\pi}{3} \)
   
   (c) \( r = 5\cos(\theta) \)
   
   (d) \( r = 6\sin(\theta) \)

4. Sketch each polar equation:
   
   (a) \( r = 1 - \cos(2\theta) \)
   
   (b) \( r = 1 + \cos(\theta) \)
   
   (c) \( r = 4 - 4\sin(\theta) \)

**Intermediate/Advanced Knowledge**

5. Convert the equation \( r(1 - \sin(\theta)) = 3 \) to rectangular equation.

6. A particle is moving on a cardioid \( r = 1 - \cos(\theta) \). What is the rate of change of the distance of the particle from the pole (origin) which respect to \( (\theta) \) when \( r = \frac{1}{2} \).