

8.3 Converting Polar and Rectangular Equations

Convert the following polar equations to rectangular equations:

1. $r = 8$

$$r^2 = 64$$

$$\boxed{x^2 + y^2 = 64}$$

2. $r \cos \theta = 6$

$$\boxed{x = 6}$$

3. $r = -5 \csc \theta$

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

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

$$\boxed{y = -5}$$

4. $r = 7 \sin \theta$

$$r^2 = 7r \sin \theta$$

$$x^2 + y^2 = 7y$$

$$\boxed{x^2 + (y - \frac{7}{2})^2 = \frac{49}{4}}$$

5. $r = -3 \sec \theta$

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

$$r \cos \theta = -3$$

$$\boxed{x = -3}$$

6. $r = 5 \cos \theta$

$$r^2 = 5r \cos \theta$$

$$x^2 + y^2 = 5x$$

$$\boxed{(x - \frac{5}{2})^2 + y^2 = \frac{25}{4}}$$

Convert the following rectangular equations to polar equations:

7. $x^2 + y^2 = 10$

$$r^2 = 10$$

$$\boxed{r = \sqrt{10}}$$

10. $y = -5$

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

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

$$\boxed{r = -5 \csc \theta}$$

8. $2x - y^2 = 0$

$$2r \cos \theta - r^2 \sin^2 \theta = 0$$

$$\frac{2r \cos \theta}{r \sin^2 \theta} = \frac{r^2 \sin^2 \theta}{r \sin^2 \theta}$$

$$r = \frac{2 \cos \theta}{\sin^2 \theta}$$

$$\boxed{r = 2 \csc \theta \cot \theta}$$

9. $x^2 + y^2 = 81$

$$r^2 = 81$$

$$\boxed{r = 9}$$

11. $y^2 = 10x$

$$\frac{r^2 \sin^2 \theta}{r \sin^2 \theta} = \frac{10r \cos \theta}{r \sin^2 \theta}$$

$$\boxed{r = 10 \cot \theta \csc \theta}$$

12. $3xy = 7$

$$3r \cos \theta r \sin \theta = 7$$

$$3r^2 \cos \theta \sin \theta = 7$$

$$\boxed{r = \sqrt{\frac{7}{3 \cos \theta \sin \theta}}}$$