Larson Chapter 8.5

Jayden Li

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52.

$$\begin{aligned} x^2 + y^2 &= 16 \\ r^2 cos^2\theta + r^2 \sin^2\theta &= 16 \\ r^2 &= 16 \\ \boxed{r = 4} \end{aligned}$$

54.

$$\begin{aligned} y &= x \\ r\sin\theta &= r\cos\theta \\ \frac{\sin\theta}{\cos\theta} &= 1 \\ \tan\theta &= 1 \\ \boxed{\theta = \pm\frac{\pi}{4} + \pi n} \end{aligned}$$

56.

$$\begin{aligned} x &= a \\ r\cos\theta &= a \\ \boxed{r = a\sec\theta} \end{aligned}$$

58.

$$\begin{aligned} 3x + 5y - 2 &= 0 \\ 3r\cos\theta + 5r\sin\theta - 2 &= 0 \\ r(3\cos\theta + 5\sin\theta) &= 2 \\ \boxed{r = \frac{2}{3\cos\theta + 5\sin\theta}} \end{aligned}$$

60.

$$\begin{aligned} 2xy &= 1 \\ 2(r\cos\theta)(r\sin\theta) &= 1 \\ r^2\cos\theta\sin\theta &= \frac{1}{2} \\ \boxed{r = \sqrt{\frac{1}{2\cos\theta\sin\theta}}} \end{aligned}$$

62.

$$\begin{aligned} y^2 - 8x - 16 &= 0 \\ r^2\sin^2\theta - 8r\cos\theta - 16 &= 0 \\ r^2 - r^2\cos^2\theta - 8r\cos\theta - 16 &= 0 \\ r^2 - \left(r^2\cos^2\theta + 8r\cos\theta + 16\right) &= 0 \\ r^2 &= (r\cos\theta + 4)^2 \\ r &= r\cos\theta + 4 \\ r\left(1 - \cos\theta\right) &= 4 \\ \boxed{r = \frac{4}{1 - \cos\theta}} \end{aligned}$$

64.

$$\begin{aligned} x^2 + y^2 - 8y &= 0 \\ r^2\left(\cos^2\theta + \sin^2\theta\right) - 8r\sin\theta &= 0 \\ r^{\cancel{2}} &= 8\cancel{r}\sin\theta \\ \boxed{r = 8\sin\theta} \end{aligned}$$

66.

$$\begin{aligned} x^2 + y^2 - 2ay &= 0 \\ r^2\left(\cos^2\theta + \sin^2\theta\right) - 2ar\sin\theta &= 0 \\ r^{\cancel{2}} &= 2a\cancel{r}\sin\theta \\ \boxed{r = 2a\sin\theta} \end{aligned}$$

68.

$$\begin{aligned} x^2 &= y^3 \\ r^2\cos^2\theta &= r^3\sin^3\theta \\ \cos^2\theta &= r\sin^3\theta \\ r &= \frac{cos^2\theta}{\sin^3\theta} \\ \boxed{r = \cot^2\theta\csc\theta} \end{aligned}$$

70.

$$\begin{aligned} r &= 2\cos\theta \\ r^2 &= 2r\cos\theta \\ x^2+y^2 &= 2x \\ (x-1)^2-1+y^2 &= 0 \\ \boxed{(x-1)^2+y^2=1} \end{aligned}$$

72.

$$\begin{aligned} \theta &= \frac{5\pi}{3} \\ \tan\theta &= \tan\frac{5\pi}{3} \\ \frac{\sin\theta}{\cos\theta} &= -\sqrt{3} \\ r\sin\theta &= -\sqrt{3}r\cos\theta \\ \boxed{y=-\sqrt{3}x} \end{aligned}$$

74.

$$\begin{aligned} \theta &= \frac{11\pi}{6} \\ \frac{\sin\theta}{\cos\theta} &= \frac{\sin\frac{11\pi}{6}}{\cos\frac{11\pi}{6}} \\ \frac{\sin\theta}{\cos\theta} &= -\frac{1}{\sqrt{3}} \\ \sqrt{3}r\sin\theta &= -r\cos\theta \\ \sqrt{3}y &= -x \\ \boxed{y=-\frac{\sqrt{3}}{3}x} \end{aligned}$$

76.

$$\begin{aligned} \theta &= \pi \\ \tan\theta &= \frac{\sin\pi}{\cos\pi} \\ \frac{\sin\theta}{\cos\theta} &= 0 \\ \sin\theta &= 0 \\ \boxed{y=0} \end{aligned}$$

78.

$$\begin{aligned} r &= 10 \\ r^2 &= 100 \\ \boxed{x^2+y^2=100} \end{aligned}$$

80.

$$\begin{aligned} r &= 2\sec\theta \\ r\cos\theta &= \frac{2}{\cos\theta}\cdot\cos\theta \\ \boxed{x=2} \end{aligned}$$

82.

$$\begin{aligned} r^2 &= \sin 2\theta \\ r^2\left(r^2\right) &= r^2\left(2\sin\theta\cos\theta\right) \\ \left(r^2\right)^2 &= 2(r\sin\theta)(r\cos\theta) \\ \left(x^2+y^2\right)^2 &= 2xy \\ \boxed{x^4+2x^2y^2+y^4-2xy=0} \end{aligned}$$

84.

$$\begin{aligned} r &= 3\cos 2\theta \\ r^3 &= 3r^2\left(\cos^2\theta-\sin^2\theta\right) \\ \left(r^2\right)^{\frac{3}{2}} &= 3r^2\cos^2\theta-3r^2\sin^2\theta \\ \sqrt{\left(x^2+y^2\right)^3} &= 3\left(x^2-y^2\right) \\ \left(x^2+y^2\right)^3 &= 9\left(x^2-y^2\right)^2 \\ x^6+3x^4y^2+3x^2y^4+y^6 &= 9\left(x^4-2x^2y^2+y^4\right) \\ \boxed{x^6+3x^4y^2+3x^2y^4+y^6=9x^4-18x^2y^2+9y^4} \end{aligned}$$

86.

$$\begin{aligned} r &= \frac{2}{1+\sin\theta} \\ r+r\sin\theta &= 2 \\ r &= 2-y \\ r^2 &= (2-y)^2 \\ x^2+\cancel{y^2} &= 4-4y+\cancel{y^2} \\ 4y &= 4-x^2 \\ \boxed{y=1-\frac{x^2}{4}} \end{aligned}$$

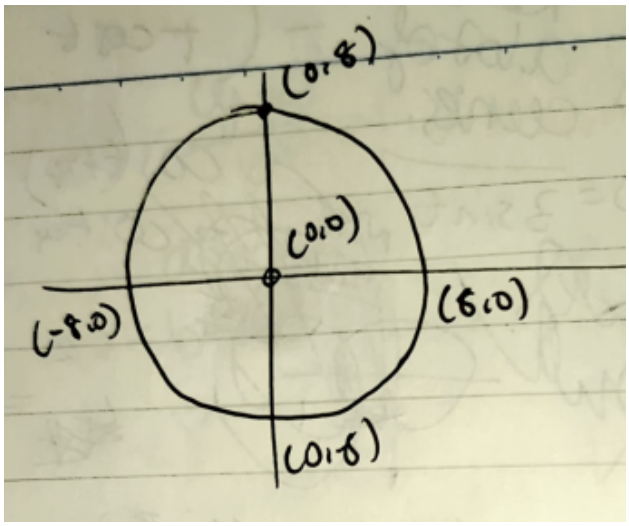
88.

$$\begin{aligned} r &= \frac{6}{2\cos\theta-3\sin\theta} \\ 1 &= \frac{6}{2r\cos\theta-3r\sin\theta} \\ 2x-3y &= 6 \\ 3y &= 2x-6 \\ \boxed{y=\frac{2}{x}x-2} \end{aligned}$$

90. Circle with radius 8.

$$r = 8$$

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



92. Line.

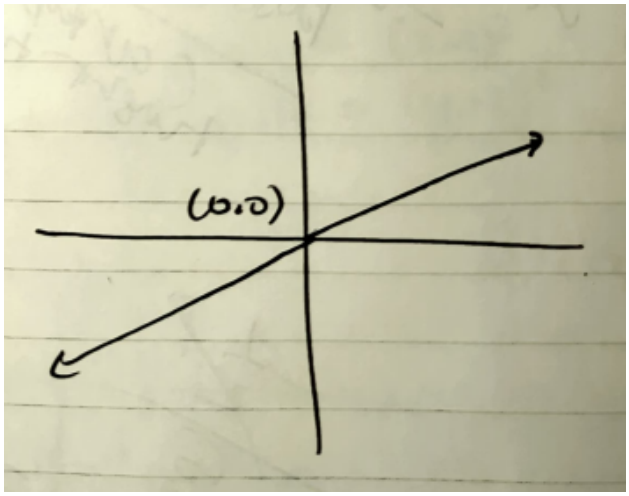
$$\theta = \frac{7\pi}{6}$$

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

$$\sqrt{3}r\sin\theta = r\cos\theta$$

$$y = -\frac{x}{\sqrt{3}}$$

$$\boxed{y = \frac{\sqrt{3}}{3}x}$$



94. Horizontal line.

$$r = 2\csc\theta$$

$$r\sin\theta = \frac{2}{\sin\theta}\cdot\sin\theta$$

$$\boxed{y = 2}$$