1. The following points are in rectangular coordinate, change them to polar coordinate. Use exact value whenever possible.

a. $(0, 1)$

Ans: $\left(1, \frac{\pi}{2}\right)$

b. $(3, 3)$

Ans: $\left(3\sqrt{2}, \frac{\pi}{4}\right)$

c. $(-\sqrt{3}, 1)$

Ans: $\left(2, \frac{5\pi}{6}\right)$

d. $(0, -1)$

Ans: $\left(1, \frac{3\pi}{2}\right)$

e. $(-1, -\sqrt{3})$

Ans: $\left(2, \frac{4\pi}{3}\right)$

f. $(-2, -3)$

Ans: $\left(\sqrt{13}, \pi + \arctan\left(\frac{3}{2}\right)\right)$

g. $(2, -5)$

Ans: $\left(\sqrt{29}, \arctan\left(-\frac{5}{2}\right)\right)$

h. $(4, -1)$

Ans: $\left(\sqrt{17}, \arctan\left(-\frac{1}{4}\right)\right)$

2. The following points are in polar coordinate, change them to rectangular coordinate. Use exact value wheneven possible.

a. $(1, 0)$

Ans: $(1, 0)$

b. $(-1, 0)$

Ans: $(-1, 0)$

c. $\left(2, \frac{2\pi}{3}\right)$

Ans: $\left(-1, \sqrt{3}\right)$

d. $\left(-3, -\frac{5\pi}{6}\right)$

Ans: $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$

e. $\left(-1, \frac{9\pi}{4}\right)$

Ans: $\left(-\frac{-\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

f. $\left(1, -\frac{\pi}{2}\right)$

Ans: $(0, -1)$

g. $(-1, 1)$

Ans: $(-\cos(1), -\sin(1))$

h. $(-4, -2)$

Ans: $(-4\cos(2), 4\sin(2))$

3. Describe the curve given by the following polar equation:

a. $r = 10$

Ans: Circle centered at origin with radius 10

b. $\theta = -\dfrac{\pi}{3}$

Ans: Straight line with slope $m = -\sqrt{3}$, goes through the origin.

c. $r = 2\theta$, $0 \leq \theta < \infty$

Ans: Spiral that spires outward at a counter-clockwise direction.

d. $r = 10\sin\theta$

Ans: Circle centered at $(0, 5)$, with radius 5.

e. $r = 8\cos\theta$

Ans: Circle centered at $(4, 0)$, with radius 4.

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

Ans: Circle centered at $(0, -1)$, with radius 1.