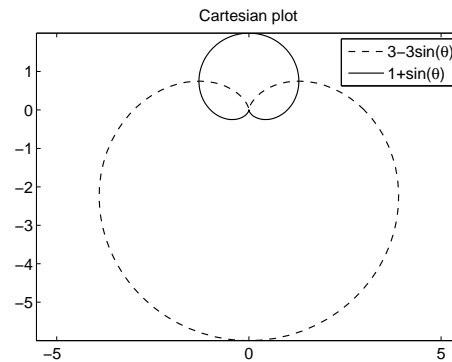
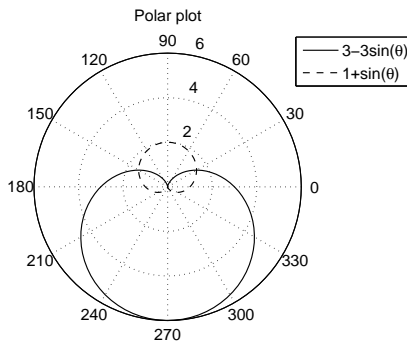


**Math 13 Worksheet #3: Double integrals in polar coordinates**

- (1) Use polar coordinates to sketch the region and evaluate the expressions.

$$2 \int_0^{\pi/2} \int_0^{\sin \theta} r dr d\theta$$

- (2) Find the area of the region inside the cardioid  $r = 3 - 3\sin \theta$  and outside the cardioid  $r = 1 + \sin \theta$ .



- (3) Find the volume of the region enclosed by the paraboloids  $z = x^2 + y^2$  and  $z = 16 - x^2 - y^2$ .