

1. Find the area inside the region bounded by  $r = 3 + 3 \sin \theta$ .
2. Consider the curves  $r = 1 + \sin \theta$  and  $r = 3 \sin \theta$ .
  - (a) Sketch the curves.
  - (b) Find the values of  $\theta$  where the curves intersect.
  - (c) Find the area of the region inside both curves.
  - (d) Find the area of the region inside  $r = 3 \sin \theta$  and outside  $r = 1 + \sin \theta$ .
3. Consider the curve  $r = 2 \csc \theta$ .
  - (a) Convert this curve into rectangular coordinates. This will give us a parametrization with  $\theta$  serving the role of  $t$ .
  - (b) What is the slope of the curve at any point  $(x, y)$ ?
  - (c) Find the length of the curve from  $\theta = \pi/6$  to  $\theta = \pi/2$ .
4. Find the arclength of the cardioid  $r = 3 + 3 \sin \theta$ .