(1) Sketch the region in the plane consisting of points whose polar coordinates satisfy the given conditions.
   (a) \(0 \leq r, \frac{\pi}{4} \leq \theta \leq \frac{3\pi}{4}\)
   (b) \(2 < r < 3, \frac{5\pi}{3} \leq \theta \leq \frac{7\pi}{3}\)

(2) Find a polar equation for the curve represented by the given Cartesian equation.
   (a) \(y = 2\)
   (b) \(xy = 4\)
   (c) \(x^2 + y^2 = 2cx\)

(3) Find the area of the region enclosed by one loop of the curve.
   (a) \(r = 4 \cos 3\theta\)
   (b) \(r^2 = \sin 2\theta\)

(4) Find the area of the region that lies inside the first curve and outside the second curve
   (a) \(r^2 = 8 \cos 2\theta; \ r = 2\)
   (b) \(r = 3 \cos \theta, \ r = 1 + \cos \theta\)

(5) Find the area of the region that lies inside both curves.
   (a) \(r^2 = \sin 2\theta; \ r = \cos 2\theta\)
   (b) \(r = 1 + \cos \theta; \ r = 1 - \cos \theta\)

(6) Find the exact length of the polar curve.
   (a) \(r = \cos \theta\)
   (b) \(r = 5^\theta; \ 0 \leq \theta \leq 2\pi\)
   (c) \(r = \cos^2(\frac{\theta}{2})\)