1) a) Find the area of the region that lies inside the graph of $r = 2 - \sin 2\theta$. Set up the intergral and then use your calculator to evaluate the area..

(b) Find the slope (dy/dx) of the curve $r = 2 - \sin 2\theta$ as a function of θ then evaluate it at $\theta = \frac{\pi}{4}$. Show the work that leads to your answer.

(c) Find $\frac{dr}{d\theta}$ for curve $r = 2 - \sin 2\theta$ and evaluate it at $\theta = \frac{\pi}{4}$. Then interpret what the value of $\frac{dr}{d\theta}$ means in terms of the movement of the particle. Show the work that leads to your answer.

d) A particle moves along $r = 2 - \sin 2\theta$ so at time t, seconds $\theta = t^2$, Find the time on the interval $0 \le t \le 1$ fo which the paricle's x-coordinate is 1.

e) For the partice described in part (d,) find the position vector in terms of t.

f) Using the position found in part (e), find the velocity vector at t = 2 seconds.

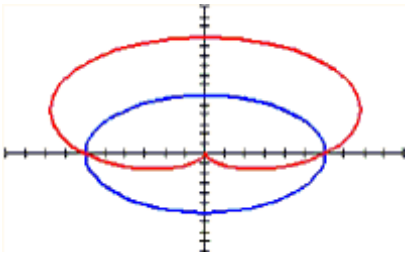
Find the area of the specified region. Set up the intergral and use your calculator to find the area.

2) inside one leaf of the four-leaved rose $r = 3 \sin 2\theta$

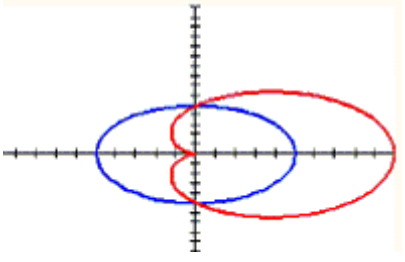
3) inside the smaller loop of the limacon $r = 5 + 10 \cos \theta$

Find the area of the specified region.

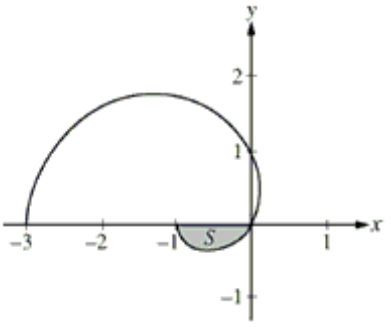
4) shared by the circle $r = 6$ and the cardioid $r = 6(1 + \sin \theta)$



5) Outside the circle $r = 5$ and inside the cardioid $r = 5(1 + \cos \theta)$



6) The graph of the polar curve $r = 1 - 2\cos\theta$ for $0 \le \theta \le \pi$ is shown. Let S be the shaded region in the third qu bounded by the curve and the x-axis.



a) Write an integral expression for the area of S.

b) Write expressions for $\frac{dx}{d\theta}$ and $\frac{dy}{d\theta}$ in terms of θ.

c) Write an equation in terms of x and y for the line tangent to the graph of the polar curve a point $\theta = \frac{\pi}{2}$. Show the computations that lead to your answer.