1. Find the foci of the ellipse given by the equation $x^2 + 4y^2 + 2x = 8$.

2. The point $P(1, 5)$ lies on the parabola given by the equation $y^2 - 8x - 2y = 7$. Let $F$ be the focus of this parabola.
   a) What are the coordinates of the focus $F$?
   b) What is the angle between the line $PF$ and the tangent to the parabola at $P$?

3. Find the equation of the ellipse with vertices at $(0, \pm 2)$ and foci at $(0, \pm 1)$.

4. Find the integral (do not try to evaluate it) giving the length of the spiral $r = 2\theta$ from $\theta = 0$ to $\theta = 2\pi$.

5. Find the area enclosed by the cardioid $r = 2 + 2\sin \theta$. 