1. Evaluate the line integral \( \oint_C \sin(x^2) \, dx + x \, dy \) where \( C \) is the triangle with vertices \((0, 0), (3, 0), \) and \((3, 2)\) oriented clockwise.

2. A particle starts at the point \((-2, 0)\), moves along the \( x \)-axis to \((2, 0)\), and then along the semicircle \( y = \sqrt{4 - x^2} \) to the starting point. Find the work done on the particle by the force field \( \mathbf{F}(x, y) = (x, x^3 + 3xy^2) \).

3. Let \( \mathbf{F}(x, y) = (e^x + x^2y, e^y - xy^2) \) and \( C \) be the circle \( x^2 + y^2 = 25 \) oriented clockwise. Evaluate \( \int_C \mathbf{F} \cdot d\mathbf{r} \).
4. Evaluate $\int_C (\sin x + 7y) \, dx + (6x + y) \, dy$ for the curve $C$ given by line segments from $(0, 0)$ to $(1, 1)$ to $(1, 2)$ to $(0, 3)$.

5. Use Green’s Theorem to compute the area inside the ellipse $\frac{x^2}{9} + \frac{y^2}{25} = 1$.

6. Find a parametrization of the curve $\frac{x^{2/3}}{3} + \frac{y^{2/3}}{3} = 9^{2/3}$ and use it to compute the area of the interior. *Hint:* Let $x(t) = 9 \cos^3 t$. 
7. Let $\mathbf{F}$ be the vector field

$$\mathbf{F}(x, y) = \left\langle \frac{-y}{x^2 + y^2}, \frac{x}{x^2 + y^2} \right\rangle.$$

Prove that $\oint_{\mathcal{C}} \mathbf{F} \cdot d\mathbf{r} = 2\pi$ for any simple closed path $\mathcal{C}$ with counterclockwise orientation that encloses the origin.

*Hint:* Consider a small circle centered at the origin, small enough so that it lies completely inside the region bounded by $\mathcal{C}$. Let $\mathcal{D}$ be the region bounded by the two curves and apply the general form of Green's Theorem.

8. Let $\mathcal{D}$ be a region bounded by a simple closed curve $\mathcal{C}$ in the $xy$-plane. Use Green’s Theorem to prove the coordinates of the centroid $(\bar{x}, \bar{y})$ of $\mathcal{D}$ are given by

$$\bar{x} = \frac{1}{2A} \oint_{\mathcal{C}} x^2 \, dy \quad \bar{y} = -\frac{1}{2A} \oint_{\mathcal{C}} y^2 \, dx$$

where $A$ is the area of $\mathcal{D}$. 