1. (1 point) True or False: If $\int_C \vec{F} \cdot d\vec{r} = 0$ for some closed path $C$, then $\vec{F}$ must be a conservative vector field.

2. (1.5 points) Let $\vec{F}(x, y) = < y + 2x, x + 3y^2 + \sin(y) >$. Determine whether $\vec{F}$ is a conservative vector field. If it is find a function $f$ such that $\vec{F} = \nabla f$.

3. (1.5 points) Let $\vec{F}(x, y) = < 2x + y, 3y^2 + e^y >$. Determine whether $\vec{F}$ is a conservative vector field. If it is find a function $f$ such that $\vec{F} = \nabla f$.
4. (3 points) Find \( \int_C \vec{F} \cdot d\vec{r} \). Where \( \vec{F} = yi - xj \) and \( C \) is the path along the circle of radius 3 starting at point (3,0) and ending at point (0,-3).

5. (3 points) Find \( \int_C \vec{F} \cdot d\vec{r} \). Where \( \vec{F} = (x^2 - y^2)i - 2xyj \) and \( C \) is the curve \( y = x^5 - x^3 + 4x + \sin(2\pi x) - 5 \) from (0,-5) to (1,-1).