1. [EC 13.2.34] Find the work done by the force field $\vec{F}(x, y) = x \sin y \vec{i} + y \vec{j}$ on a particle that moves along the parabola $y = x^2$ from $(-1, 1)$ to $(2, 4)$.

2. [EC 13.3.{4,6,8}] Determine whether or not $\vec{F}$ is a conservative vector field. If it is, find a function f such that $\vec{F} = \nabla f$.

   (a) $\vec{F}(x, y) = (x^3 + 4xy)\vec{i} + (4xy - y^3)\vec{j}$

   (b) $\vec{F}(x, y) = e^y \vec{i} + xe^y \vec{j}$

   (c) $\vec{F}(x, y) = (1 + 2xy + \ln x)\vec{i} + x^2 \vec{j}$

3. [EC 13.3.14] Find a function f such that $\nabla f = \vec{F}$ and use it to evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F}(x, y, z) = (2xz + y^2)\vec{i} + 2xy\vec{j} + (x^2 + 3z^2)\vec{k}$ and C is the curve given by $\vec{r}(t) = t^2\vec{i} + (t + 1)\vec{j} + (2t - 1)\vec{k}$ for $0 \leq t \leq 1$.

4. [EC 13.4.2] Evaluate the line integral first directly, and then using Green's Theorem: $\int_C y\,dx - x\,dy$, where C is the unit circle centered at the origin.

5. [EC 13.4.8] Use Green's Theorem to evaluate the line integral $\int_C x^2y^2\,dx + 4xy^3\,dy$ where C is the positively oriented curve along the triangle with vertices $(0, 0)$, $(1, 3)$, and $(0, 3)$.