1. Compute \( \int_C (6xy\vec{r} + 3x^2\vec{j}) \cdot d\vec{r} \) for a path beginning at (3, 0) and ending at (0, -3).

2. Compute \( \int_C (y^2, xy) \cdot d\vec{r} \) for a path \( C \) given by \( \vec{r}(t) = (2 + 3t, 1 - 5t) \) for \( 0 \leq t \leq 1 \).
1. Compute $\mathbf{F} \cdot d\mathbf{r}$ for the vector field $\mathbf{F}(x, y) = \left( 2xy, x^2 - 6y \right)$ and with $C$ the sinusoidal path beginning at $(3, 0)$ and ending at $(-3, 0)$ and performing 17 complete oscillations on this interval.

2. Compute $\mathbf{F} \cdot d\mathbf{r}$ for the vector field $\mathbf{F}(x, y) = x^2y\mathbf{i} + y^3\mathbf{j}$ and with $C$ an arc of a circle (centered at the origin) of radius 3 passing counterclockwise through the first and second quadrants.