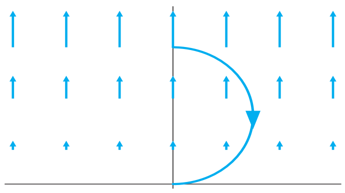
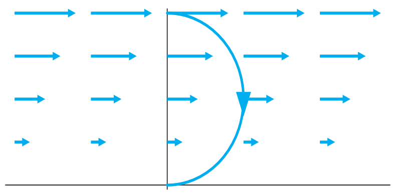
Problem 1: For each of the paths and vector fields below, state whether you expect the line integral along the curve to be positive, negative, or zero.

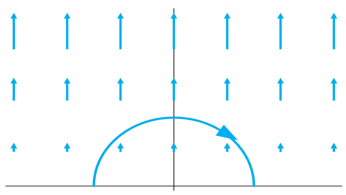
(a)



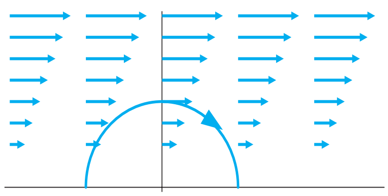
(b)



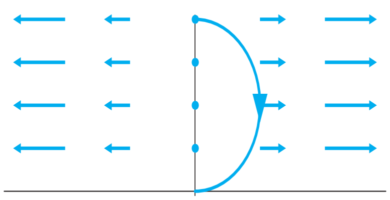
(c)



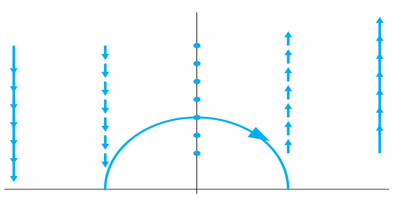
(d)



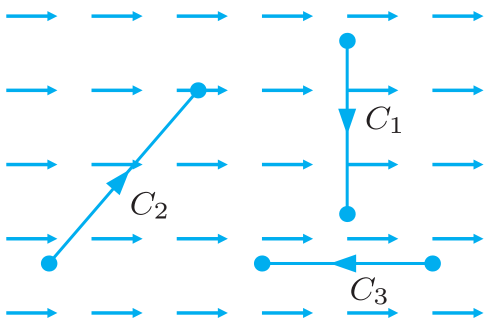
(e)



(f)



Problem 2: Consider the vector field $\vec{F}$ shown below together with the paths C_1, C_2, and C_3. Arrange the line integrals over the curves in ascending order.



Problem 3: Compute the line integrals.

(a) $\int_C \begin{bmatrix} x+y & y \end{bmatrix}^T \cdot d\vec{r}$ where C is the quarter unit circle from $(1,0)$ to $(0,1)$.

(b) $\int_C \begin{bmatrix} 3 & y+5 \end{bmatrix}^T \cdot d\vec{r}$ where C is the line from $(0,0)$ to $(0,3)$.

(c) $\int_C \begin{bmatrix} x^2+y & y^3 & 0 \end{bmatrix}^T \cdot d\vec{r}$ where C consists of the two line segments from $(4,0,0)$ to $(4,3,0)$ to $(0,3,0)$.

(d) $\int_C (\sin(x)\vec{i} + \cos(x^2)\vec{j}) \cdot d\vec{r}$ where C is the parabola $y = x^2$ from $(0,0)$ to $(2,4)$.

Problem 4: Compute the line integrals.

(a) $\int_C 3y\ dx + 4x\ dy$ where C is the line from $(1,3)$ to $(5,9)$.

(b) $\int_C x\ dx + z\ dy - y\ dz$ where C is the circle of radius 3 in the yz-plane centered at the origin, oriented counterclockwise when viewed from the positive y-axis.