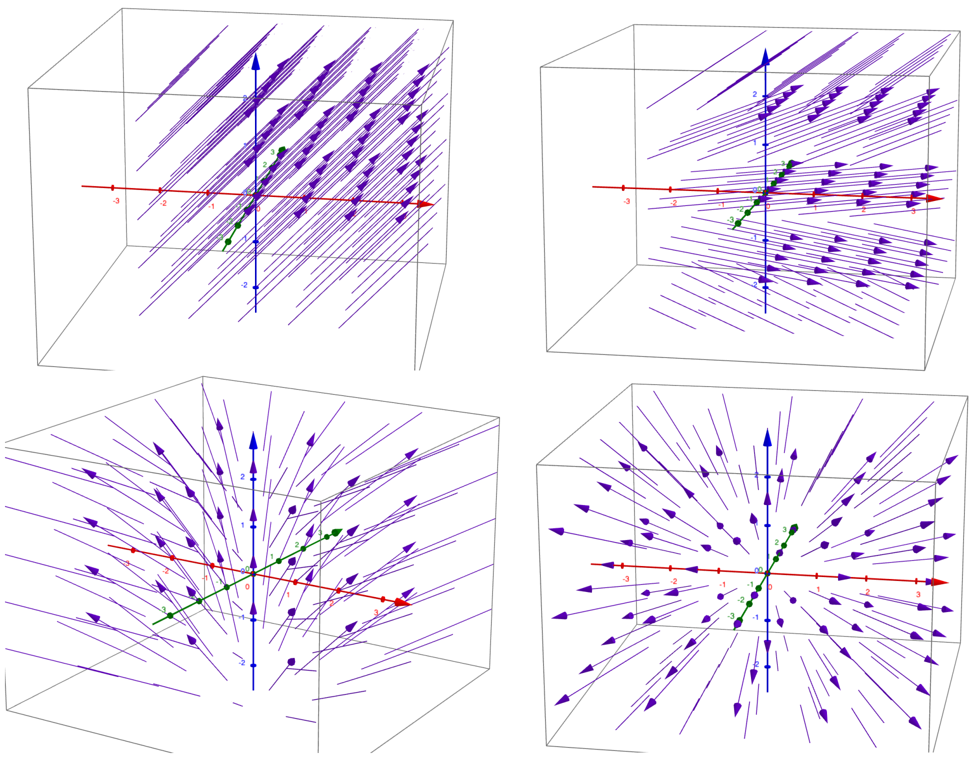
1

Match the vector fields with plots

1. $F(x, y, z) = 3i + 2j + zk$.
2. $F(x, y, z) = xi + yj + zk$.
3. $F(x, y, z) = 3i + j + 3k$.
4. $F(x, y, z) = xi + yj + k$.



2

Determine if vectors are conservative and find a potential function if possible.

1. $F(x, y) = (2xy + y^2)\overrightarrow{i} + (x^2 + 2xy)\overrightarrow{j}$.
2. $F(x, y) = xe^{xy}\overrightarrow{i} + ye^{xy}\overrightarrow{j}$.
3. $F(x, y) = \left(3x^2 + \frac{1}{\sqrt{x}}\right)\overrightarrow{i} - (1 - 2\sqrt{x})\overrightarrow{j}$

3

Evaluate the following integrals.

1. $\int_C xe^y \, ds$ with C is a line segment from (0,2) to (3,5).

2. $\int_C z^2 \, dx + x^2 \, dy + y^2 \, dz$ with C is a line segment from $(2, 0, 0)$ to $(3, 1, 2)$.

3. $\int_C xyz \, ds$ with C: $x = 2\sin t$, $y = 1$, $z = -2\cos t$, and $0 \leq t \leq \pi$.

4. $\int_C \overrightarrow{F} \cdot d\overrightarrow{r}$ where $\overrightarrow{F} = \langle y^2,\ x^2 - 4 \rangle$ and C is $y = (x-1)^2,\ x \in [0, 3]$.

5. $\int_C \overrightarrow{F} \cdot d\overrightarrow{r}$ where $\overrightarrow{F} = \langle 3,\ xy - 2x \rangle$ and C is the top half of the circle centered at the origin with radius 5.

4

Use Green's Theorem to evaluate the following integrals

1. $\displaystyle\int\limits_C (y^4 - 2y) \, dx - (6x - 4xy^3) \, dy$, with C starts from $(0, 0)$ to $(1, 0)$ to $(1, 2)$.

2. $\displaystyle\int\limits_C xy^2 \, dx - x^2 y \, dy$, and C is the area between 2 circles centered at the origin and radius 2 and radius 3 with positive orientation (counter clock-wise).

3. $\displaystyle\int\limits_C (y^3 + y) \, dx + (x^2 y + 3xy^2) \, dy$, and C is the area bounded by $y = 1$ and $y = x^2$ with positive orientation (counter clock-wise). (Solve the line integral and the double integral forms and confirm that they are the same.)