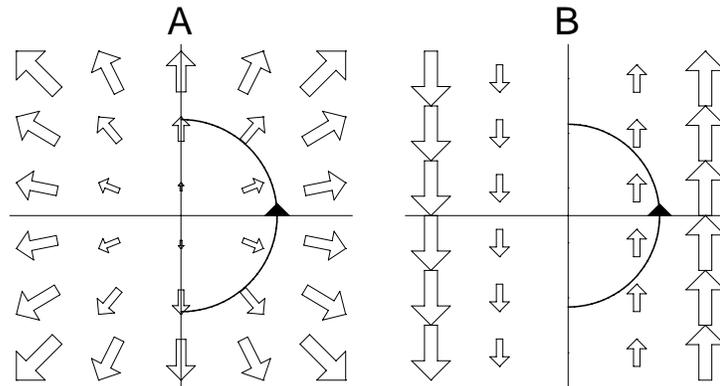


Directions: Show **ALL** work for credit; Give **EXACT** answers when possible; Start each problem on a **SEPARATE** page; Use only **ONE** side of each page; Be neat; Leave margins on the left and top for the **STAPLE**; Calculators can be used for graphing and calculating only; Nothing written on this page will be graded;

- Given $S = \{(u, v) : 0 \leq u, 0 \leq v, u + v \leq 1\}$, $x = 2u + 5$, $y = u - v$.
 - sketch S in the uv -plane.
 - compute the Jacobian of the transformation.
 - compute the inverse transformation.
 - sketch R , the image of S in the xy -plane.
- Find formulas for the two vector fields below. (There are many possible answers.) Decide if the line integrals over the given curves will be positive, negative or zero in each plot.



- Write and **EVALUATE** a triple integral which will give mass of the washer W with thickness T , inner radius S , outer radius R and whose density δ is proportional to the square of the distance from the central axis.
- Sketch the region (include drawings of the shadow in the xy -plane and a 2D z vs r plot ($r > 0$)) for integral below. Rewrite the triple integral in spherical coordinates. Do **NOT** evaluate either of the integrals.

$$\int_{x=-5}^0 \int_{y=-\sqrt{25-x^2}}^0 \int_{z=-\sqrt{50-x^2-y^2}}^{-\sqrt{x^2+y^2}} xyz^2 dz dy dx$$

- If the vector field $\vec{F} = \langle 2x^2, xy \rangle$ and the curve C is the counterclockwise arc of the circle $x^2 + y^2 = 25$ from $(-5, 0)$ to $(0, -5)$, compute the line integral

$$\int_C \vec{F} \cdot d\vec{r}$$