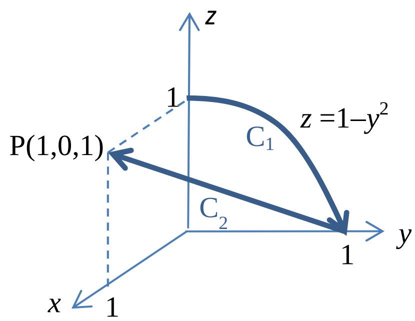
1. Find the line integral of vector field $\vec{\mathbf{F}}(\vec{\mathbf{r}}) = \left\langle \sqrt{y},\ x,\ z \right\rangle$ over a path connecting points (0,0,1) and (1,0,1) and consisting of a parabolic segment C_1 and a straight line C_2, as indicated in the figure



2. Consider the vector field $\vec{\mathbf{F}}(\vec{\mathbf{r}}) = \langle x - y,\ x \rangle$:

a) Sketch this vector field in the *x*-*y* plane

b) Find the total circulation of this vector field around a triangular closed curve connecting vertices (0,0), (2,0) and (0,1).

c) Find the **flux** of this vector field **across** a circle of radius 2 centered at the origin

3. Consider vector field $\vec{\mathbf{F}}(\vec{\mathbf{r}}) = \left\langle z^2 + yze^{xz},\ e^{xz} - 2y\sin\left(y^2\right),\ 2xz + xye^{xz} \right\rangle$.

a. Show that $\vec{\mathbf{F}}(\vec{\mathbf{r}})$ is conservative by calculating its curl, $\vec{\nabla} \times \vec{\mathbf{F}}(\vec{\mathbf{r}})$

b. Find the potential function of this vector field.

c. Find total work performed by this force over a path from point (1, 0, 0) to point (0, $\sqrt{\pi}$, 1)