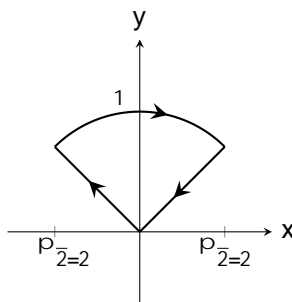


1. [2350/050823 (46 pts)] A wire is in the shape of the curve C given by $\mathbf{r}(t) = t\mathbf{i} + t\mathbf{j} + t^2\mathbf{k}; \quad -1 \leq t \leq 2$.
- (a) [9 pts] Does the wire intersect the plane that contains the points $(1; 2; 0); (0; 0; 3); (0; -1; 4)$? If so, find the point of intersection. If not, explain why not.
- (b) [5 pts] What is the curvature of the wire when $t = 0$?
- (c) [15 pts]

2. [2350/050823 (20 pts)] Consider the oriented curve, C , shown in the figure (the curved portion is an arc of the unit circle). Compute the circulation of V on C where $V = (16y + \sin x^2) \mathbf{i} + (4e^y + 3x^2) \mathbf{j}$.



SOLUTION: _____ :

4. [2350/050823 (20 pts)] Compute $\int_C P dx + Q dy + R dz$ where $F = P\mathbf{i} + Q\mathbf{j} + R\mathbf{k} = y\mathbf{i} + x^2\mathbf{j} + z\mathbf{k}$ by evaluating an appropriate surface integral. C is the boundary of the portion of the plane $x + y + 5z = 1$ in the first octant, oriented counterclockwise when viewed from above.

SOLUTION:

We use Stokes' Theorem.

$$\mathbf{r} = y\mathbf{i} + x^2\mathbf{j} + z\mathbf{k}$$

The surface is $g(x; y; z) = x + y + 5z$ which we project onto the xy -plane giving R as the triangle with vertices $(0; 0)$; $(1; 0)$; $(0; 1)$ and $(0; 0)$.

(b) The function z