

Module 5 self assessment

Question 1

Find the flux of $\mathbf{f}(x, y) = xy^2\hat{\mathbf{i}} + x\hat{\mathbf{j}}$ through the semicircle

$$c : x^2 + y^2 = 1, \quad y \leq 0$$

with clockwise direction.

Question 2

Find the flux of $\mathbf{f}(x, y) = y \sin x \hat{\mathbf{i}} + \sin y \hat{\mathbf{j}}$ through a square with vertices $(0, 0)$, $(\frac{\pi}{2}, 0)$, $(\frac{\pi}{2}, \frac{\pi}{2})$ and $(0, \frac{\pi}{2})$ in anticlockwise direction.

Question 3

Solve the integral

$$\int_c x(x + y) ds,$$

on a c given parametrically in terms of the position vector $\mathbf{r}(t) = (1 + t)\hat{\mathbf{i}} + (2 + 3t)\hat{\mathbf{j}}$ for $0 \leq t \leq 1$.

Hint: Recall that the definition of the position vector in Cartesian coordinates is $\mathbf{r} = x\hat{\mathbf{i}} + y\hat{\mathbf{j}}$.