5. $\int_C (x^2+y^2-z)\,ds$ $\quad$ $C: \vec{r}(t) = (\sin t)\vec{i} + (\cos t)\vec{j} + 3\vec{k}$

$0 \le t \le \frac{\pi}{2}$

$x(t) = \sin t \quad y(t) = \cos t \quad z(t) = 3$

$f(x,y,z) = x^2 + y^2 - z$

$f(x(t), y(t), z(t)) = (\sin t)^2 + (\cos t)^2 - 3$

$= 1 - 3$

$= -2$

$\int_a^b f(x(t), y(t), z(t)) \sqrt{[x'(t)]^2 + [y'(t)]^2 + [z'(t)]^2}\, dt$

$x'(t) = \cos t$

$y'(t) = -\sin t$

$z'(t) = 0$

$\int_0^{\frac{\pi}{2}} (-2) \sqrt{(\cos t)^2 + (-\sin t)^2 + 0^2}\, dt$

$-2 \int_0^{\frac{\pi}{2}} \sqrt{1}\, dt$

$= -2 \int_0^{\frac{\pi}{2}} 1\, dt$

$= -2 \left[t \right]_0^{\frac{\pi}{2}}$

$= -2 \left[\frac{\pi}{2} - 0 \right]$

$= \boxed{-\pi}$