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MAT 323-Vector & Tensor Analysis
Exam # 2

1) Find the work of the vector field $\bar{F} = x\bar{i} + y\bar{j}$ along the quarter-circle parametrized by $\bar{r}(t) = \cos t\,\bar{i} + \sin t\,\bar{j}$, $0 \le t \le \pi/2$. (15 points)

2) a) Sketch the plane triangle T in R^3 parametrized by $r(u,v) = (2u+v,\ v,\ 3u+v)$ for $0 \le u$, $0 \le v$, $u+v \le 1$.

   b) Find the area of T. (20 points)

3) Let $\sum$ be the helicoid parametrized by $\bar{r}(u,v) = (u\cos v,\ u\sin v,\ v)$, $0 \le u \le 1$, $0 \le v \le \pi/2$.

   If $\sum$ and its boundary C are oriented coherently, use Stokes' theorem to evaluate the work of $\bar{F} = z\bar{i} + x\bar{j} + y\bar{k}$ along C. (35 points)

4) Let S be the closed surface that is the boundary of the solid region inside the cylinder $x^2 + y^2 = 4$ and between the planes $z = 0$ and $z = 2$. Suppose S is positively oriented, with normal vector pointing out at each point. Find the flux of the vector field $\bar{F} = (x^3,\ y^3 + x,\ xy)$ across S. (30 points)