Math 210
Exam 3

1. Evaluate

\[ \int_C \vec{F} \cdot d\vec{r} \]

where \( \vec{F} = x\vec{i} + xy\vec{j} \) and \( C \) consists of the line segments from \((0,0)\) to \((2,0)\) and from \((2,0)\) to \((2,2)\).

Evaluate \( \int_C x\,ds \) where \( C \) is as above.
2. Evaluate the line integral $\int_C (e^x + x^2y)dx + (x + y^5 + e^{y^2} \sin(y^2))dy$ where $C$ is the triangle with vertices $(0,0), (2,4), (0,4)$.
3. Calculate the integral $\int \int_S \vec{F} \cdot d\vec{S}$ where $\vec{F} = x\vec{i} + z^2\vec{j} + (x^2 + ye^{x})\vec{k}$ and $S$ is the tetrahedron enclosed by the surface $x + y + z = 1$ and the planes $x = 0, y = 0, z = 0$. 
4. Calculate the integral $\int \int_S 1 \, dS$ where $S$ is the surface given by $x = uv$, $y = u + v$ and $z = u - v$, with $u^2 + v^2 \leq 1$. 
5. Calculate the integral \( \int \int_S \vec{F} \cdot d\vec{S} \) where \( \vec{F} = x\hat{i} + (y + 1)\hat{j} \) and \( S \) is the part of the surface \( x + y + z = 1 \) in the first octant.