**MATH 264 Class Test**
**Tuesday March 7, 2006.**
**This is a closed book test. No calculators are permitted.**
**Each question is worth 10 marks.**

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1. Compute the line integral
$$\int_c (x+y)ds,$$
where $c$ is the triangle in the XY plane with vertices at $(0,0,0), (1,0,0)$ and $(0,1,0)$.

2. Show that the vector field
$$\mathbf{F} = (2xyz^3 + z\cos(xz), x^2z^3, 3x^2yz^2 + x\cos(xz)),$$
is conservative by finding a potential for $\mathbf{F}$. Compute the line integral
$$\int_c \mathbf{F}.dr,$$
where $c$ is the curve $\mathbf{c}(t) = (2-t, 1+\cos(\pi t), 3t^2), 0 \leq t \leq 1$.

3. Compute the surface integral
$$\iint_S |xyz| dS,$$
where $S$ is the portion of the surface $z = x^2 + y^2$ which lies below the plane $z = 1$.
( Note: Watch the absolute value sign in the integrand.)

4. Compute the outward flux of the vector field
$$\mathbf{F} = (xz, y, x)$$
across the surface $S$ consisting of the cylinder $y^2 + z^2 = 1, 0 \leq x \leq 1$, closed with the "lids" $y^2 + z^2 \leq 1, x = 1$ and $y^2 + z^2 \leq 1, x = 0$.