MAC 2313 Calculus 3 **Test 6** 17 Nov 2004

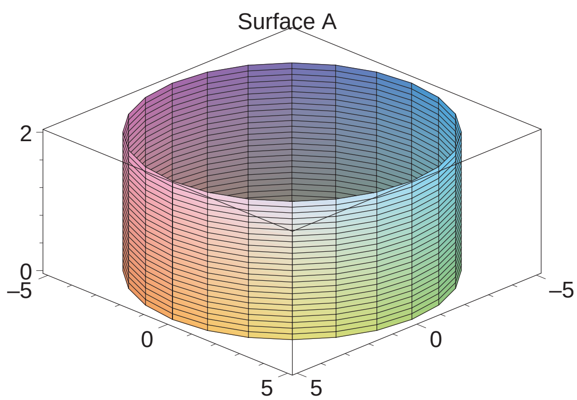
Directions: Show **ALL** work for credit; Give **EXACT** answers when possible; Start each problem on a **SEPARATE** page; Use only **ONE** side of each page; Be neat; Leave margins on the left and top for the **STAPLE**; Calculators can be used for graphing and calculating only; Nothing written on this page will be graded;

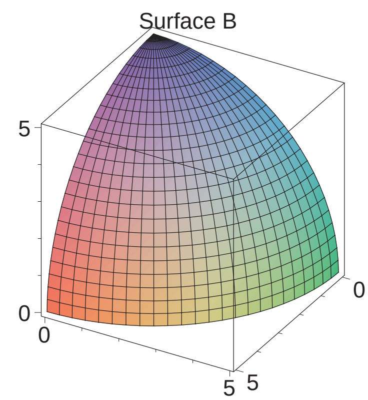
1. Find the curl $\vec{F}$ and div $\vec{G}$ for $\vec{F} = \langle xy^2z, xyz^3, x^4yz \rangle$ and $\vec{G} = \left\langle xy\ln(xy), \ln(x/y), e^{x^2+y^2+z^2} \right\rangle$

2. Compute the line integral below by the using the Fundamental Theorem of Calculus for Line Integrals. The curve C is a complex zig-zag line from $(1, 2, -1)$ to $(3, 2, 1)$

$$\int_C \langle 6xyz, 3x^2z + 2z, 3x^2y + 2y + 2z \rangle \cdot d\vec{r}$$

3. Find the parameteric equations $\vec{r}(u, v)$ with limits like $a \le u \le b$, $c \le v \le d$ for the the pieces of cylinders and spheres pictured below.





4. Compute the line integral $\int_C \vec{F} \cdot d\vec{r}$, if $\vec{F} = \langle xy^3, 3y^2 \rangle$ and C is the straight line segment from $(2, 0)$ to $(0, 5)$

5. By evaluating both integrals, check Green's theorem

$$\oint_{\partial D} \vec{F} \cdot d\vec{r} = \iint_D Q_x - P_y \, dA$$

when $D = \{(x, y) : y \ge 0, x^2 + y^2 \le 25\}$ is the semi-circular disk in the first two quadrants and $\vec{F} = \langle 25 - y^2, x \rangle$. Note that ∂D has two pieces, an arc and part of the x-axes.