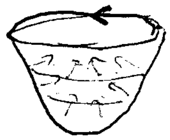
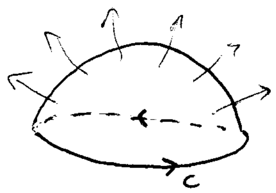
SECTION TWO

(1) 

Since S is oriented upwards, C is oriented counterclockwise when viewed from the top (RH rule). Parametrize C by

$$x = \cos t \qquad y = \sin t \qquad z = 1 \qquad 0 \le t \le 2\pi$$

Then
$$\iint_S (\text{curl } \underset{\sim}{F}) \cdot d\underset{\sim}{S} = \oint_C \underset{\sim}{F} \cdot d\underset{\sim}{r}$$
$$= \int_{t=0}^{t=2\pi} \langle \sin^3 t, 1, 1 \rangle \cdot \langle -\sin t, \cos t, 0 \rangle \, dt$$
$$= \int_{t=0}^{t=2\pi} (\underbrace{\cancel{\cos t}}_{\text{symmetry}} - \sin^4 t) \, dt = \ldots = \underline{\underline{3\pi/4}}$$

(2) 

Since S is oriented upwards, C is oriented counterclockwise when viewed from the top. (RH rule). Parametrize C by

$$x = 2\cos t \qquad y = 2\sin t \qquad z = 0 \qquad 0 \le t \le 2\pi$$

Then
$$\iint_S (\text{curl } \underset{\sim}{F}) \cdot d\underset{\sim}{S} = \oint_C \underset{\sim}{F} \cdot d\underset{\sim}{r}$$
$$= \int_{t=0}^{t=2\pi} \langle 4\cos^2 t, 4\sin^2 t, 0 \rangle \cdot \langle -2\sin t, 2\cos t, 0 \rangle \, dt$$
$$= \underline{\underline{0}} \quad \text{(symmetry)}$$

SECTION THREE

(1) $$\text{curl } \underset{\sim}{F} = \begin{vmatrix} \underset{\sim}{i} & \underset{\sim}{j} & \underset{\sim}{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ z & 2x & 3y \end{vmatrix} = \langle 3, 1, 2 \rangle$$