1. Evaluate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$ for the given vector field $\mathbf{F}$ and the oriented surface S. In other words, find the flux of $\mathbf{F}$ across S. For closed surfaces, use the positive (outward) orientation.

a)

$$\mathbf{F}(x, y, z) = xy\mathbf{i} + yz\mathbf{j} + zx\mathbf{k},$$

where S is the part of the paraboloid $z = 4 - x^2 - y^2$ that lies above the square $0 \leq x \leq 1$, $0 \leq y \leq 1$, and has upward orientation.

b)

$$\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + 5\mathbf{k},$$

where S is the boundary of the region enclosed by the cylinder $x^2 + z^2 = 1$ and the planes $y = 0$ and $x + y = 2$.

2. Use Stokes' Theorem to evaluate $\iint_S \text{curl } \mathbf{F} \cdot d\mathbf{S}$.

a)

$$\mathbf{F}(x, y, z) = xyz\mathbf{i} + xy\mathbf{j} + x^2yz\mathbf{k},$$

where S consists of the top and the four sided (but not the bottom) of the cube with vertices $(\pm 1, \pm 1, \pm 1)$, oriented outward.

b)

$$\mathbf{F}(x, y, z) = e^{xy}\mathbf{i} + e^{xz}\mathbf{j} + x^2 z\mathbf{k},$$

where S is the half of the ellipsoid $4x^2 + y^2 + 4z^2 = 4$ that lies to the right of the xz-plane, oriented in the direction of the positive y-axis.

3. Use Stokes' Theorem to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$. C is oriented counterclockwise as viewed from above.

$$\mathbf{F}(x, y, z) = (x + y^2)\mathbf{i} + (y + z^2)\mathbf{j} + (z + x^2)\mathbf{k},$$

C is the triangle with vertices $(1, 0, 0)$, $(0, 1, 0)$, and $(0, 0, 1)$.

Course (the last) Homework due Review session (TBD)

Apr 28, Mon. : **16.7** 19, 21, 23, 27. **16.8** 1, 3, 5
Apr 30, Wed. : **16.8** 7, 9, 11(a), 13, 15, 19, 20
May 2, Fri. : **16.9** 1, 3, 5, 7, 9, 11, 13, 17, 23, 24, 25, 26, 27