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

$$\mathbf{F}(x, y, z) = xy\mathbf{i} + 2z\mathbf{j} + 3y\mathbf{k},$$

$C$ is the curve of intersection of the plane $x + z = 5$ and the cylinder $x^2 + y^2 = 9$.

2. Suppose $S$ and $C$ satisfy the hypotheses of Stokes' Theorem and $f$, $g$ have continuous second-order partial derivatives. Show that

a)

$$\int_C (f \nabla g) \cdot d\mathbf{r} = \iint_S (\nabla f \times \nabla g) \cdot d\mathbf{S}$$

b) As a corollary of a),

$$\int_C (f \nabla g + g \nabla f) \cdot d\mathbf{r} = 0$$

3. Use the Divergence Theorem to calculate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$; that is, calculate the flux of $\mathbf{F}$ across $\mathbf{S}$.

(a)
$$\mathbf{F}(x, y, z) = x^2yz\mathbf{i} + xy^2z\mathbf{j} + xyz^2\mathbf{k},$$
where $S$ is the surface of the box enclosed by the planes $x = 0$, $x = a$, $y = 0$, $y = b$, $z = 0$, and $z = c$, where $a$, $b$, and $c$ are positive numbers.

(b)
$$\mathbf{F}(x, y, z) = x^2 \sin y\mathbf{i} + x \cos y\mathbf{j} - xz \sin y\mathbf{k},$$
where $S$ is the "fat sphere" $x^8 + y^8 + z^8 = 8$.

(c)
$$\mathbf{F}(x, y, z) = (\cos z + xy^2)\mathbf{i} + xe^{-z}\mathbf{j} + (\sin y + x^2z)\mathbf{k},$$
where $S$ is the surface of the solid bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 4$.

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