1. (#10) Use Stokes' theorem to evaluate \( \int_C \mathbf{F} \cdot d\mathbf{r} \) for \( \mathbf{F}(x, y, z) = xy\mathbf{i} + yz\mathbf{j} + zx\mathbf{k} \), where \( C \) is the triangle with vertices (1, 0, 0), (0, 1, 0), and (0, 0, 1), oriented counterclockwise as viewed from above.

2. (#7) Use Stokes' theorem to evaluate \( \int_C \mathbf{F} \cdot d\mathbf{r} \) for \( \mathbf{F}(x, y, z) = 2y\mathbf{i} + xz\mathbf{j} + (x + y)\mathbf{k} \), where \( C \) is the curve of intersection of the plane \( z = y + 2 \) and the cylinder \( x^2 + y^2 = 1 \), oriented counterclockwise as viewed from above.

3. (#25) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z^2\mathbf{k} \), where \( S \) is the sphere with radius 1 and center the origin, with outer normal.

4. (#27) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = y\mathbf{j} - z\mathbf{k} \), where \( S \) is the boundary of the region \( x^2 + z^2 \leq y \leq 1 \) with outer normal.

5. (#31) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = x^2\mathbf{i} + y^2\mathbf{j} + z^2\mathbf{k} \), where \( S \) is the boundary of the solid half cylinder \( 0 \leq z \leq \sqrt{1 - y^2}, 0 \leq x \leq 2 \), with outer normal.

6. (#32) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = z\mathbf{i} + y^2\mathbf{j} + x^2\mathbf{k} \), where \( S \) is the boundary of the paraboloid \( z = 1 - x^2 - y^2 \) that lies above the \( xy \)-plane, oriented upward.

7. (#43) A fluid has density \( 870 \text{ kg/m}^3 \) and flows with velocity \( \mathbf{v} = z\mathbf{i} + y^2\mathbf{j} + x^2\mathbf{k} \), where \( x \), \( y \), and \( z \) are measured in meters and the components of \( \mathbf{v} \) in meters per second. Find the rate of flow outward through the cylinder \( x^2 + y^2 = 4, 0 \leq z \leq 1 \).

8. (#46) Use Gauss’ Law to find the charge enclosed by the cube with vertices \((\pm1, \pm1, \pm1)\) if the electric field is \( \mathbf{E}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k} \).

9. (#23) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = x^2\sin y \mathbf{i} + xy\mathbf{j} + xz\sin y\mathbf{k} \), where \( S \) is the part of the paraboloid \( z = 1 - x^2 - y^2 \) that lies above the \( xy \)-plane, oriented upward.

10. (§16.7 #23) Evaluate the surface integral \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = xy\mathbf{i} + yz\mathbf{j} + zx\mathbf{k} \), where \( S \) is part of the paraboloid \( z = 4 - x^2 - y^2 \) that lies above the square \( 0 \leq x \leq 1, 0 \leq y \leq 1 \), with upward normal.

11. (§16.8 #2) Use Stokes' theorem to evaluate \( \int_S \mathbf{F} \cdot d\mathbf{S} \) for \( \mathbf{F}(x, y, z) = x^2 \sin z \mathbf{i} + y^2\mathbf{j} + z^2\mathbf{k} \), where \( S \) is the part of the paraboloid \( z = x - x^2 - y^2 \) that lies above the \( xy \)-plane, oriented upward.

12. (§16.8 #5) Use Stokes' theorem to evaluate \( \int_C \mathbf{F} \cdot d\mathbf{r} \) for \( \mathbf{F}(x, y, z) = xy\mathbf{i} + xy\mathbf{j} + x^2yz\mathbf{k} \), where \( S \) consists of the top and the four sides (but not the bottom) of the cube with vertices \((\pm1, \pm1, \pm1)\), oriented outward.

13. (§16.8 #7) Use Stokes' theorem to evaluate \( \int_C \mathbf{F} \cdot d\mathbf{r} \) for \( \mathbf{F}(x, y, z) = (x + y^2)\mathbf{i} + (y + z^2)\mathbf{j} + (z + x^2)\mathbf{k} \), where \( C \) is the triangle with vertices \((1, 0, 0), (0, 1, 0), \) and \((0, 0, 1)\), oriented counterclockwise as viewed from above.