Problems from the book:

Section 8.2: 5, 6, 19a, 21.

Section 8.3: 3, 4, 5, 7, 10, 13, 15.

Additional Problems

A1. Use Stokes' theorem to compute the total circulation of the vector field $\mathbf{F}(x,y,z) = -y\,\mathbf{i}+x\,\mathbf{j}+yz\,\mathbf{k}$ about the closed curve formed by the intersection of the cylinder $x^2+y^2=1$ and the surface $z=x^2-y^2$.

A2. Compute the line integral $\int_C \mathbf{F}\cdot d\mathbf{s}$, where $\mathbf{F}(x,y,z) = xy\,\mathbf{i}+2z\,\mathbf{j}+2y\,\mathbf{k}$, and C is the curve of intersection of the plane $x+z=5$ and the cylinder $x^2+y^2=5$.

A3. If S is an ellipsoid and $\mathbf{F}$ satisfies the hypotheses of Stokes' theorem, what is the value of $\iint_S \operatorname{curl}(\mathbf{F})\cdot d\mathbf{S}$? (Give reasons for your answer.)

A4. Let $\mathbf{F}(x,y,z) = (ax^3-3xz^2)\,\mathbf{i}+(x^2y+by^3)\,\mathbf{j}+(cz^3)\,\mathbf{k}$. Let C be a fixed closed curve and consider all possible smooth surfaces S whose boundary curve is C. Find the values of a, b, and c for which $\iint_S \mathbf{F}\cdot d\mathbf{S}$ is independent of the choice of the surface S.