Divergence Theorem

The Divergence Theorem

Let Q be a solid region bounded by a closed surface S oriented by a unit normal vector directed outward from Q. If **F** is a vector field whose component functions have continuous first partial derivatives in Q, then:

$$\iint_S F \cdot N \, dS = \iiint_Q div\, \mathrm{F} \, dV$$

1. Use the Divergence Theorem to evaluate the integral and find the outward flux of F through the surface of the solid bounded by the graphs of the equations.
(Similar to p.1131 #7-18)

$$\iint_S F \cdot N \, dS$$

$$F(x, y, z) = (2x^2)i + (3y^2)j + (z^2)k$$

$$S : x = 0, x = 2, y = 0, y = 1, z = 0, z = 3$$

2. Use the Divergence Theorem to evaluate the integral and find the outward flux of F through the surface of the solid bounded by the graphs of the equations.
(Similar to p.1131 #7-18)

$$\iint_S F \cdot N \, dS$$

$$F(x, y, z) = (2x)i + (2y)j + (2z)k$$

$$S : x^2 + y^2 + z^2 = 4$$

3. Use the Divergence Theorem to evaluate the integral and find the outward flux of F through the surface of the solid bounded by the graphs of the equations.
(Similar to p.1131 #7-18)

$$\iint_S F \cdot N \, dS$$

$$F(x, y, z) = (2x)i + (y^2)j + (2z)k$$

$$S : x^2 + y^2 = 9, z = 0, z = 5$$

4. Use the Divergence Theorem to evaluate the integral and find the outward flux of F through the surface of the solid bounded by the graphs of the equations.
(Similar to p.1131 #7-18)

$$\iint_S F \cdot N \, dS$$

$$F(x, y, z) = (2x^3)i + (5x^2 y)j + (e^{xy})k$$

$$S : z = 5 - y, z = 0, x = 0, x = 2, y = 0$$