Name ________________________

Homework 25

Sections 20.1 & 20.2

1. (2) Compute the divergence of the following vector fields at the given points.

   (a) $\vec{F}(x,y,z) = x^3\vec{i} + (4zy - xy + e^y)\vec{j} - (xy + \frac{2}{z})\vec{k}$ at $(3,0,2)$

   (b) $\vec{F}(x,y,z) = xyz\vec{i} + axyz\vec{j} + a^2xyz\vec{k}$ at $(3a, 2a^2, a^3)$.

2. (3) Number 12 on page 1001.

   (a) ________________

   (b) ________________

   (c) ________________

3. (5) Consider the vector field $\vec{G} = (2x^2 + yz)\vec{i} + (y^2 - e^z)\vec{j} - (2x + y)z\vec{k}$ and the closed box whose base is in the xy-plane with vertices at $(-1, -1, 0)$, $(1, -1, 0)$, $(1, 2, 0)$, and $(-1, 2, 0)$ and which extends in the positive z direction to a height of 4. Compute the flux of $\vec{G}$ out of the box.

4. (6) Let $\vec{F} = xy\vec{i} - x^2z\vec{j} + 2z\vec{k}$. Calculate the flux of $\vec{F}$ out of the *open top* box $0 \le x \le 2$, $0 \le y \le 4$, $0 \le z \le 3$.

5. (5) Let S be the surface of the ice cream cone bounded between the graphs of $x^2+y^2+z^2=a^2$ and $z=\sqrt{x^2+y^2}$. Compute the flux of

$$\vec{F}=\left(x^3+xy^2\right)\vec{\imath}+\left(2y^3-3y+yx^2-z\right)\vec{\jmath}+\left(3z-3y^2z+\frac{4}{3}z^3\right)\vec{k}$$

through S.