1. Suppose $\nabla \cdot \mathbf{F} = xyz^2$.

(a) Find $\nabla \cdot \mathbf{F}$ at the point $(1, 2, 1)$.

Note: You are given $\nabla \cdot \mathbf{F}$, not $\mathbf{F}$!

(b) Using your answer to part (a), but no other information about the vector field $\mathbf{F}$, estimate the flux out of a small box of side 0.2 centered at the point $(1, 2, 1)$ and with edges parallel to the axes.

(c) Without computing the vector field $\mathbf{F}$, calculate the exact flux out of the box.

2. A smooth vector field $\mathbf{G}$ satisfies

$$\left. \left( \nabla \times \mathbf{G} \right) \right|_{(0,0,0)} = 2 \mathbf{i} - 3 \mathbf{j} + 5 \mathbf{k}$$

Estimate the circulation $\oint \mathbf{G} \cdot d\mathbf{r}$ around a circle of radius 0.01 centered at the origin in each of the following planes:

(a) $xy$-plane, oriented counterclockwise when viewed from the positive $z$-axis.

(b) $yz$-plane, oriented counterclockwise when viewed from the positive $x$-axis.

(c) $xz$-plane, oriented counterclockwise when viewed from the positive $y$-axis.