Problem 1

Integrate $G(x, y, z)$, over the parabolic cylinder $y = x^2$, $0 \leq x \leq 2$, $0 \leq z \leq 3$.

Problem 2

Find the flux of $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ across the sphere $x^2 + y^2 + z^2 = a^2$ (where a is a constant) in the direction away from the origin.

Problem 3

Find the centroid of the portion of the sphere $x^2 + y^2 + z^2 = a^2$ that lies in the first octant (x, y, z are all positive).

Problem 4

Find the flux of $\mathbf{F} = -x\mathbf{i} - y\mathbf{j} + z^2\mathbf{k}$ across the portion of the cone $z = \sqrt{x^2 + y^2}$ that lies between $z = 1$ and $z = 2$ in the direction away from the z-axis.