MA2E01 Tutorial problems #9
(due at the end of your tutorial)

1. Find the flux of $\boldsymbol{F}(x, y, z) = \langle x, y, 2z \rangle$ through the surface σ when σ is the part of the cone $z = \sqrt{x^2 + y^2}$ that lies between the planes $z = 0$ and $z = 1$, oriented upwards.

2. Find the flux of $\boldsymbol{F}(x, y, z) = \langle z, 4x, y \rangle$ through the surface σ when σ is the part of the plane $2x + y + z = 4$ that lies in the first octant, oriented upwards.

3. Use the divergence theorem to find the outward flux of $\boldsymbol{F}(x, y, z) = \langle x^3, y^3, z^3 \rangle$ through the (entire) surface of the cylinder $y^2 + z^2 = 4$ that lies between $x = 0$ and $x = 2$.

4. Use Stokes' theorem to compute $\int_C \boldsymbol{F} \cdot d\boldsymbol{r}$ when $\boldsymbol{F}(x, y, z) = \langle z^2, y^2, x \rangle$ and C is the rectangle with vertices $(0, 0, 0)$, $(1, 0, 0)$, $(1, 2, 2)$ and $(0, 2, 2)$, oriented counterclockwise as one looks down to the plane $y = z$ that contains the rectangle.