Practice Problems: Determine which FT if any to use; don't calculate

Find the flux of $\langle \boldsymbol{x^3}, \boldsymbol{y^3}, \boldsymbol{z^3} \rangle$ flowing out of the sphere $x^2 + y^2 + z^2 = 1$.

Find the work done by $\vec{\boldsymbol{F}}(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}) = \langle \boldsymbol{x} - \boldsymbol{y}, \boldsymbol{y} - \boldsymbol{z}, \boldsymbol{z} - \boldsymbol{x} \rangle$ along the path C which is the boundary of the portion of the plane $x + y + z = 1$ with $x, y, z \geq 0$, traversed counterclockwise when viewed from above.

Find $\iint_S z^2 dS$ where S is the sphere $x^2 + y^2 + z^2 = 4$.

Find $\iiint\limits_E \operatorname{div}\vec{F} dV$ with $\vec{\boldsymbol{F}}(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}) = \langle (\boldsymbol{x^2} + \boldsymbol{y^2} + \boldsymbol{z^2})\boldsymbol{x}, (\boldsymbol{x^2} + \boldsymbol{y^2} + \boldsymbol{z^2})\boldsymbol{y}, (\boldsymbol{x^2} + \boldsymbol{y^2} + \boldsymbol{z^2})\boldsymbol{z} \rangle$ and E is the cube with vertices $(\pm 1, \pm 1, \pm 1)$.

Find the work done by $\oint_{\boldsymbol{C}} \left(\ln(\boldsymbol{1} + \boldsymbol{y}) \boldsymbol{dx} + \frac{\boldsymbol{xy}}{\boldsymbol{1} + \boldsymbol{y}} \boldsymbol{dy} \right)$, where C is the parallelogram with vertices $(0, 0), (1, 0), (1, 1), (0, 1)$ traversed counterclockwise.

Find the work done by $\vec{\boldsymbol{F}}(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}) = \langle \boldsymbol{2xy^2z}, \boldsymbol{2x^2yz}, \boldsymbol{x^2y^2} - \boldsymbol{2z} \rangle$ along the path C consisting of the line segment joining $(0, 1, 0)$ to $(1, 0, 0)$, followed by the semicircular arc joining $(1, 0, 0)$ to $(-1, 0, 0)$.