VECTOR CALCULUS
CW

1, a) Find a and b such that the surfaces $ax^2 - byz = (a+2)x$ and $4x^2y + z^3 = 4$ cut orthogonally at $(1, -1, 2)$.

b) Find the equation of the tangent plane and normal line to the surface $xyz = 4$ at the point $i + 2j + 2k$.

2 a) If F is a vector point function, prove that $\nabla \times (\nabla \times F) = \nabla(\nabla \cdot F) - \nabla^2 \vec{F}$

b) Find $\nabla \cdot \left(\frac{1}{r}\vec{r}\right)$ where $\vec{r} = xi + yj + zk$

c) Prove that $\text{div}(\text{curl}\ \vec{F}) = 0$

3 a) Find $f(r)$ if the vector $f(r)\vec{r}$ is both solenoidal and irrotational

b) Prove that $\nabla^2 f(r) = f''(r) + \left(\frac{2}{r}\right) f'(r)$