

- ① If  $\vec{F} = 2xyz^3\hat{i} + x^2z^3\hat{j} + 3x^2yz^2\hat{k}$ , show that  $\vec{F}$  is irrotational. Find the scalar potential  $u$  such that  $\vec{F} = \text{grad } u$ . H.W. Ans.  $x^2yz^3 + C$
- ② Prove that  $\text{div} (r^n \vec{r}) = (n+3)r^n$ . Further, show that  $r^n \vec{r}$  is solenoidal only if  $n = -3$ .
- ③ If  $\vec{V} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$ , and  $\vec{V}$  is irrotational, find the velocity potential. Ans.  $\phi = xy + yz + zx + C$