

**Internal Assignment for UG Mathematics(UGP)-2022**  
**Department of Mathematics(UG & PG)**  
**Ramananda College**  
**Semester IV**  
**F.M. 10**  
**Time 30 Minutes**  
**Paper Code: SP/MTH/401/C-1D**  
**(Differential Equations & Vector Calculus)**

Answers any two

1. If  $\vec{a}$  and  $\vec{b}$  be two non-collinear vectors such that  $\vec{a} = \vec{c} + \vec{d}$ , where  $\vec{c}$  is a vector parallel to  $\vec{b}$  and  $\vec{d}$  is a vector perpendicular to  $\vec{b}$ , then obtain expressions for  $\vec{c}$  and  $\vec{d}$  in terms of  $\vec{a}$  and  $\vec{b}$ .
2. Show that  $\vec{\alpha} \times (\vec{\beta} \times \vec{\gamma}) + \vec{\beta} \times (\vec{\gamma} \times \vec{\alpha}) + \vec{\gamma} \times (\vec{\alpha} \times \vec{\beta}) = \vec{0}$  that the three vectors  $\vec{\alpha} \times (\vec{\beta} \times \vec{\gamma})$ ,  $\vec{\beta} \times (\vec{\gamma} \times \vec{\alpha})$ ,  $\vec{\gamma} \times (\vec{\alpha} \times \vec{\beta})$  are coplanar.
3. Define Lipschitz function and Lipschitz constant. Show that  $f(x, y) = 3x^2 + 2y^2$  is satisfies Lipschitz condition in the region S:  $|x| \leq 2$ ,  $|y| \leq 3$ . Give an example of a function which does not satisfy Lipschitz condition, justify your answer.  
1+2+2
4. What Picard's Theorem. Explain Linear homogeneous and non-homogeneous equations of higher order with constant coefficients.  
Write down derivations to solve Euler's equation.

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