

**Indian Institute of Technology Guwahati**  
**Statistical Inference and Multivariate Analysis (MA324)**  
**Problem Set 11**

1. Show that the residual from a linear regression model can be expressed as  $\mathbf{e} = (I - H) \boldsymbol{\varepsilon}$ .
2. Consider the linear regression  $y = \beta_0 + \beta_1 x_1 + \dots + \beta_p x_p + \epsilon$ , with usual assumptions on  $\epsilon$ . Show that

$$\sum_{i=1}^n \text{Var}(\hat{y}_i) = (p+1)\sigma^2.$$

3. Show that  $0 \leq h_{ii} \leq 1$ .
4. Show that  $e_{(i)} = \frac{e_i}{1-h_{ii}}$ .