Need \( \frac{\partial \sigma_{mn}}{\partial x_m} + f_n = 0 \quad f_n = 0 \)

\( a) \)
\[ \frac{\partial \sigma_{11}}{\partial x_1} + \frac{\partial \sigma_{21}}{\partial x_2} + \frac{\partial \sigma_{31}}{\partial x_3} = 0 \]

Since \( \frac{\partial \sigma_{11}}{\partial x_1} = 0 \), \( \sigma_{21} = 0 \) \( \Rightarrow \) \( \frac{\partial \sigma_{31}}{\partial x_3} = 0 \)

\( b) \)
\[ \frac{\partial \sigma_{12}}{\partial x_1} + \frac{\partial \sigma_{22}}{\partial x_2} + \frac{\partial \sigma_{32}}{\partial x_3} = 0 \]

Since \( \sigma_{12} = \sigma_{22} = \sigma_{32} = 0 \) \( \Rightarrow \) no additional information

\( c) \)
\[ \frac{\partial \sigma_{13}}{\partial x_1} + \frac{\partial \sigma_{23}}{\partial x_2} + \frac{\partial \sigma_{33}}{\partial x_3} = 0 \]

Since \( \frac{\partial \sigma_{23}}{\partial x_2} = \frac{\partial \sigma_{33}}{\partial x_3} = 0 \) \( \Rightarrow \) \( \frac{\partial \sigma_{13}}{\partial x_1} = 0 \)

\( \frac{\partial \sigma_{31}}{\partial x_3} = \frac{\partial \sigma_{13}}{\partial x_1} = 0 \quad \text{and} \quad \sigma_{13} = 0 \) everywhere in \( x_3 \)

\( \sigma_{13} = \text{constant} \) in \( x_1 \).
6) \sigma_{11} = C \left( \frac{M}{I} \right) x_3 z_1

\frac{\partial \sigma_{11}}{\partial x_1} = \left( \frac{CM}{I} \right) x_3

\Rightarrow \frac{\partial \sigma_{11}}{\partial x_1} + \frac{\partial \sigma_{31}}{\partial x_3} = 0 \Rightarrow \frac{\partial \sigma_{31}}{\partial x_3} = -\left( \frac{CM}{I} \right) x_3

\sigma_{31} = -\left( \frac{CM}{I} \right) x_3^2 + D

\text{but} \quad \sigma_{31} = 0 \text{ for } \pm h.

\therefore \quad D = \left( \frac{CM}{I} \right) \frac{h^2}{2} \Rightarrow \sigma_{31} = \frac{CM}{2I} \left( h^2 - x_3^2 \right)

\text{From (3)} \quad \frac{\partial \sigma_{13}}{\partial x_1} = 0 \quad \text{i.e. Shear Stress Constant along length.