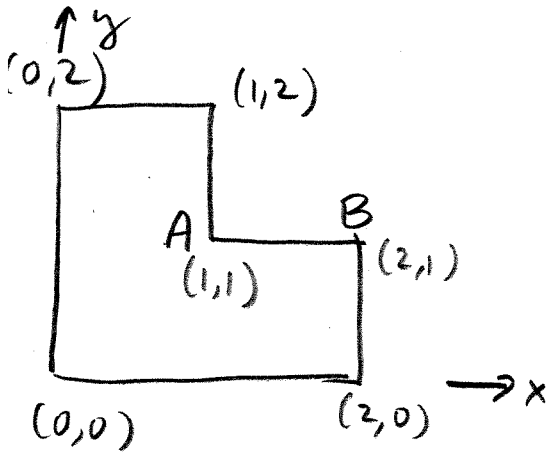
ME 423 Test #5 name key



The L-shape is in plane stress and the z-thickness is 1. The stress is described by

$$\Phi = cx^4y + y^5$$

Fn appropriate numerical value c.

Find the resultant normal force on edge AB.

$$F_{AB}^{normal} = \int_1^2 \sigma_y \Big|_{y=1} dx = \int_1^2 \frac{\partial^2 \Phi}{\partial x^2}\Big|_{y=1} dx = \int_1^2 12cx^2y \Big|_{y=1} dx = 12c\int_1^2 x^2 dx = 28c$$

To find c require

$$0 = \frac{\partial^4 \Phi}{\partial x^4} + 2\frac{\partial^4 \Phi}{\partial x^2 \partial y^2} + \frac{\partial^4 \Phi}{\partial y^4} = 4\cdot3\cdot2\cdot1cy + 0 + 5\cdot4\cdot3\cdot2y \Rightarrow c = -5$$

$$F_{AB}^{normal} = 28(-5) = -140$$

$F_{AB}^{normal} = \underline{140}$ magnitude tensile / (compressive) circle one