

## MATH35021: EXAMPLE SHEET<sup>1</sup> VIII

1.) What is the necessary relationship between the constants  $A$  and  $B$  if

$$\phi = Ax_1^2x_2^3 + Bx_2^5$$

is to serve as an Airy stress function?

2.) a) Show that

$$\phi = \frac{3F}{4c} \left( x_1x_2 - \frac{x_1x_2^3}{3c^2} \right) + \frac{P}{4c}x_2^2$$

is a valid Airy stress function.

b) Now assume that  $\phi$  describes the stress field in the cantilever beam of thickness  $2c$ , as sketched in Fig. 1. Determine the stress field and consider the physical meaning of the constants  $F$  and  $P$  [Hint: Examine the resultant forces at the left end of the beam].

c) Given the physical interpretation from part (b), explain why  $\tau_{11}$  increases linearly with  $x_1$ . [Hint: Examine the balance of moments about the point  $(x_1, 0)$ ].

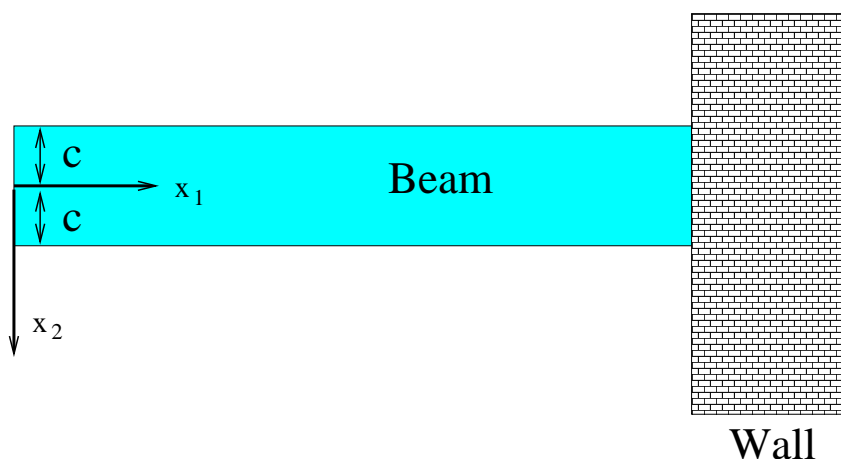


Figure 1: Sketch of a cantilever beam.

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