

[**Elongation of constant-stress column**

[> **restart;**

[incremental extension:

[> **d_delta:=(P+W(y))/(A(y)*E);**

$$d_delta := \frac{P + W(y)}{A(y) E}$$

[weight at height y:

[> **W:=y -> int(rho*g*A(xi),xi=0..y);**

$$W := y \rightarrow \int_0^y \rho g A(\xi) d\xi$$

[area as function of y:

[> **A:=y -> Pi*r(y)^2;**

$$A := y \rightarrow \pi r(y)^2$$

[radius as function of y (from Prob. 1.10):

[> **r:=y -> r_0*exp(Pi*rho*g*r_0^2*y/(2*P));**

$$r := y \rightarrow r_0 e^{\left(\frac{1}{2} \frac{\pi \rho g r_0^2 y}{P}\right)}$$

[final result: integrate incremental extension of height of column:

[> **'delta'=simplify(int(d_delta,y=0..L));**

$$\delta = \frac{LP}{\pi r_0^2 E}$$

MIT OpenCourseWare
<http://ocw.mit.edu>

3.11 Mechanics of Materials

Fall 1999

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.