Elongation of constant-stress column

```
> restart;
```

incremental extension:

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

$$d\_delta := \frac{P + \mathrm{W}(y)}{\mathrm{A}(y)\, E}$$

weight at height *y:*

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

$$\mathrm{W} := y \to \int_0^y \rho\, g\, \mathrm{A}(\xi)\, d\xi$$

area as function of *y:*

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

$$A := y \to \pi\, \mathrm{r}(y)^2$$

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

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

$$r := y \to r\_0\, \mathbf{e}^{\left(1/2 \frac{\pi \rho\, g\, r\_0^2\, y}{P}\right)}$$

final result: integrate incremental extension of height of column:

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

$$\delta = \frac{L\, P}{\pi\, r\_0^2\, E}$$

3.11 Mechanics of Materials
Fall 1999