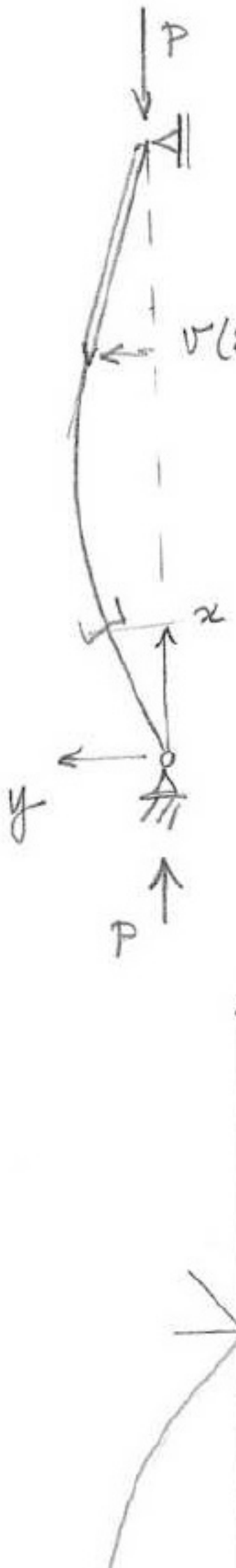
Equilíbrio na conf. deformada: $M(x) = P.v(x)$

$$v'' = -\frac{P\,v(x)}{EI} \Rightarrow \qquad v'' + k^2 v = 0$$



$$v(x) = A \operatorname{sen} bx + B \cos bx$$

$$v'(x) = Ak \cos bx - Bk \operatorname{sen} bx$$

CC:

$$v(0) = 0 \Rightarrow \qquad B = 0$$

$$v'(2a) = -\frac{v(2a)}{a}$$

$$Ak \cos 2ka = -\frac{A \operatorname{sen} 2ka}{a} \Rightarrow \qquad \operatorname{tan} 2ka = -ka$$

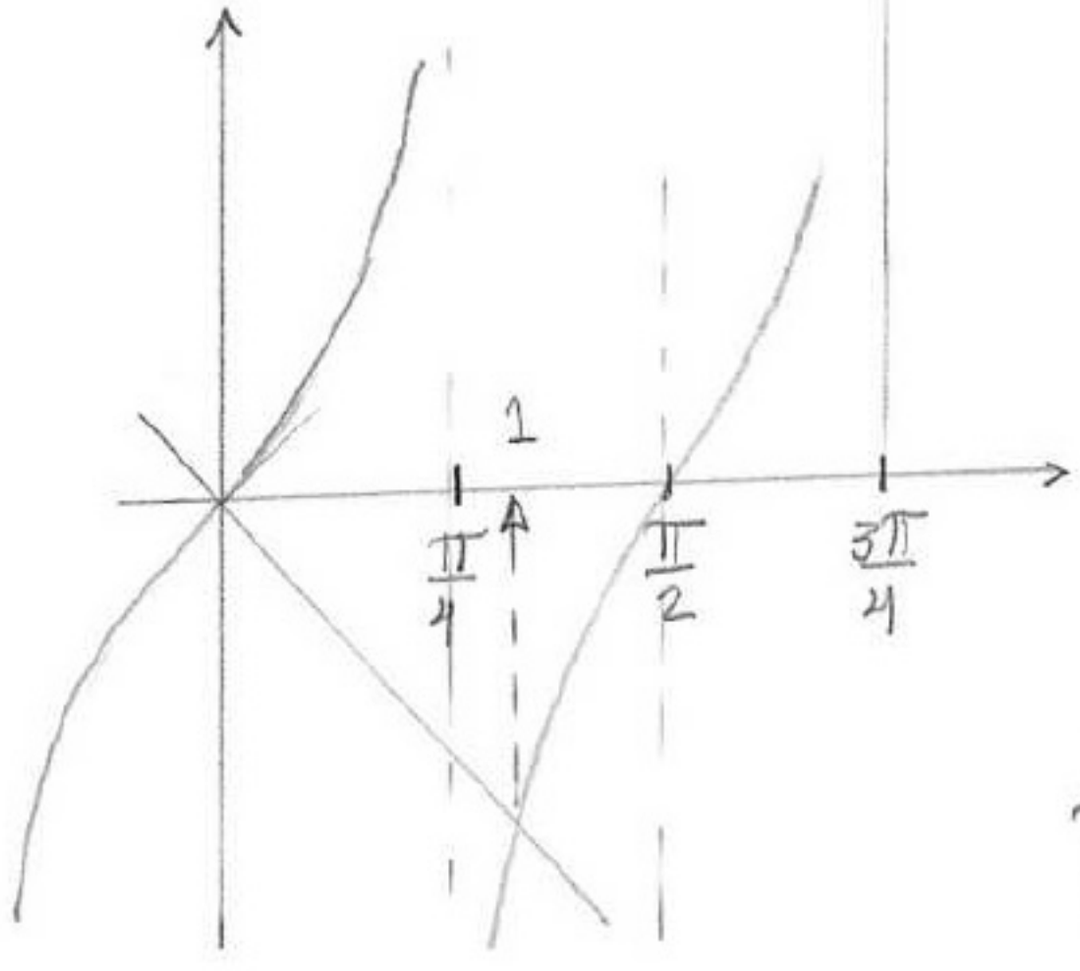
$ka = 1{,}146$

ka	$\operatorname{tan} 2ka$
1	- 2,18
1,1	- 1,37
1,15	- 1,12
1,14	- 1,16
1,145	- 1,142
1,146	- 1,147

$$\sqrt{\frac{P}{EI}}\,a = 1{,}146$$

$$P_{cr} = \frac{1{,}146^2\,EI}{a^2}$$

$$= \frac{\pi^2 EI}{\left(\frac{\pi}{1{,}146}a\right)^2}$$



$$P_{cr} = \frac{\pi^2 EI}{(2{,}74a)^2} = \frac{\pi^2 EI}{(0{,}914\ell)^2}$$