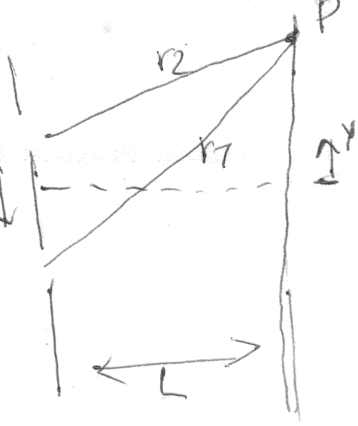
Ej 3

a) $\Delta\phi = \frac{2\pi}{\lambda}\Delta r$

$r_1 = \sqrt{(y+d/2)^2 + L^2}$

$r_2 = \sqrt{(y-d/2)^2 + L^2}$

$\Delta r = r_1 - r_2$



$$r_1 - r_2 = L\sqrt{\left(\frac{y+d/2}{L}\right)^2+1} - L\sqrt{\left(\frac{y-d/2}{L}\right)^2+1}$$

$$\approx L\left(1 + \frac{1}{2}\left(\frac{y+d/2}{L}\right)^2 - 1 - \frac{1}{2}\left(\frac{y-d/2}{L}\right)^2\right) = \frac{dy}{L}$$

$\Rightarrow \Delta\phi = \frac{2\pi}{\lambda}\frac{dy}{L}$ → máximos → mínimos

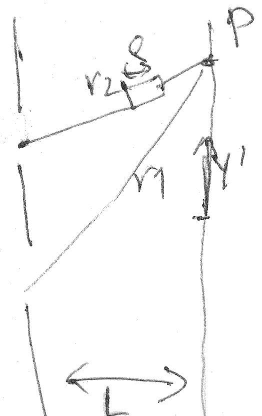
$\Delta\phi = 2m\pi$

$\Rightarrow y_{max} = m\frac{\lambda L}{d}$

$\Delta\phi = (2m+1)\pi$

$\Rightarrow y_{min} = \frac{2m+1}{2}\frac{\lambda L}{d}$

b)



$$\Delta\phi = \frac{2\pi}{\lambda}\left[r_1 - (r_2 - \ell + n\ell)\right]$$

$$= \frac{2\pi}{\lambda}\left(r_1 - r_2 + \ell(1-n)\right) = \frac{2\pi}{\lambda}\left(\frac{dy'}{L} - \frac{\ell}{2}\right)$$

$y_{5max} = 5\frac{\lambda L}{d} = y_0'$

La franja central corresponde a $\Delta\phi = 0$

$$\Rightarrow \frac{dy_0'}{L} - \frac{\ell}{2} = 0 \Rightarrow 5\lambda = \frac{\ell}{2}$$

$\Rightarrow \ell = 10\lambda$

$\boxed{\ell = 6\mu m}$