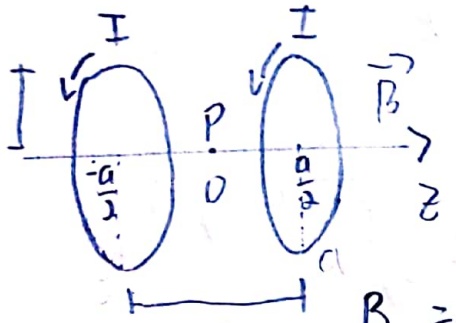
(13)



JA SABEMOS COMO OBTER O CAMPO DE UMA ESPIRA, BASTA ENTÃO SOMARMOS DOS DOIS.

$$B_{-\frac{a}{2}} = \frac{\mu_0 I R^2}{2\left[R^2+\left(z+\frac{a}{2}\right)^2\right]^{3/2}}$$

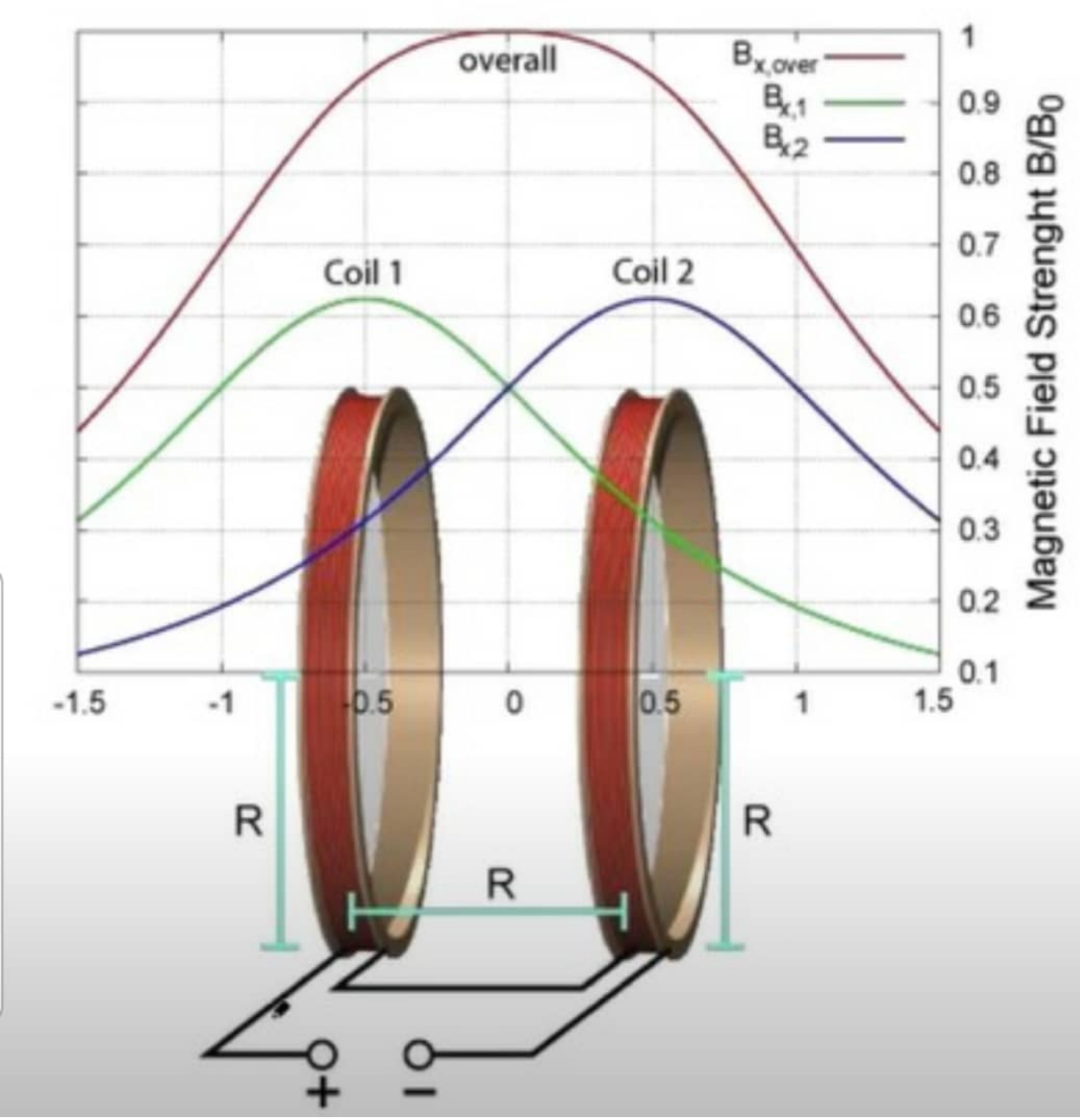
$$B_{+\frac{a}{2}} = \frac{\mu_0 I R^2}{2\left[R^2+\left(z-\frac{a}{2}\right)^2\right]^{3/2}}$$

$$B_{TOT} = \frac{\mu_0 I R^2}{2}\left\{\frac{1}{\left[R^2+\left(z+\frac{a}{2}\right)^2\right]^{3/2}} + \frac{1}{\left[R^2+\left(z-\frac{a}{2}\right)^2\right]^{3/2}}\right\}$$

NO PONTO P TEMOS QUE $z=0$

$$\left.\frac{\partial B_{TOT}}{\partial z}\right|_{z=0} = \mu_0 I R^2\left[\frac{-3z\left(z^2-\frac{a^2}{2}\right)}{\left(\left(z^2-\frac{R^2}{2}\right)^2+R^2\right)^{5/2}} - \frac{3z\left(z^2+\frac{a^2}{2}\right)}{\left(\left(z^2+\frac{R^2}{2}\right)^2+R^2\right)^{5/2}}\right|_{z=0} = 0 \;//$$

ISSO FICA MAIS CLARO QUANDO VEMOS O GRÁFICO DO CAMPO NESSE EIXO:



QUANTO A SEGUNDO PODEMOS VER CLARAMENTE NA EXPRESSÃO A SEGUIR QUE SE FIZERMOS O LIMITE $a \to R$ COM z NO PONTO P QUE ELA É IGUALMENTE NULA.

A SEGUNDA PARTE, BEM COMO A 1ª ESTA MUITO BEM RESOLVIDA NO KLEBER DAUM MACHADO NO EXEMPLO 14.4 NO PDF ENVIADO A VOCÊS OU 15.4 NA MAIS MODERNA.

d^2/dz^2(u_0*i/2(R^2/(R^2+(z^2+R^2/2)^2)^(3/2)+R^2/(R^2+(z^2-R^2/2)^2)^(3/2)))

NATURAL LANGUAGE | MATH INPUT | EXTENDED KEYBOARD | EXAMPLES

Assuming i is the imaginary unit | Use i as a variable instead

Derivative

$$\frac{\partial^2}{\partial z^2}\left(\frac{1}{2}u_0\, i\left(\frac{R^2}{\left(R^2+\left(z^2+\frac{R^2}{2}\right)^2\right)^{3/2}}+\frac{R^2}{\left(R^2+\left(z^2-\frac{R^2}{2}\right)^2\right)^{3/2}}\right)\right)=$$

$$\frac{1}{2}i\,u_0\left(R^2\left(-\frac{12\,z^2}{\left(\left(z^2-\frac{R^2}{2}\right)^2+R^2\right)^{5/2}}+\frac{60\,z^2\left(z^2-\frac{R^2}{2}\right)^2}{\left(\left(z^2-\frac{R^2}{2}\right)^2+R^2\right)^{7/2}}-\frac{6\left(z^2-\frac{R^2}{2}\right)}{\left(\left(z^2-\frac{R^2}{2}\right)^2+R^2\right)^{5/2}}\right)+\right.$$

$$\left.R^2\left(-\frac{12\,z^2}{\left(\left(\frac{R^2}{2}+z^2\right)^2+R^2\right)^{5/2}}+\frac{60\,z^2\left(\frac{R^2}{2}+z^2\right)^2}{\left(\left(\frac{R^2}{2}+z^2\right)^2+R^2\right)^{7/2}}-\frac{6\left(\frac{R^2}{2}+z^2\right)}{\left(\left(\frac{R^2}{2}+z^2\right)^2+R^2\right)^{5/2}}\right)\right)$$