Use
$$E_q$$
 (6-38) $B_x = \frac{N\mu_0 I b^2}{2} \left\{ \frac{1}{\left[(\frac{d}{2} + x)^2 + b^2 \right]^{3/2}} - \frac{1}{\left[(\frac{d}{2} - x)^2 + b^2 \right]^{3/2}} \right\}$.

$$\alpha) A_f x = 0, \quad B_x = \frac{N\mu_0 I b^2}{\left[(\frac{d}{2} + x)^2 + b^2 \right]^{3/2}}.$$

$$b) \frac{dB_x}{dx} = \frac{N\mu_0 I b^2}{2} \left\{ -\frac{3(\frac{d}{2} + x)}{\left[(\frac{d}{2} + x)^2 + b^2 \right]^{5/2}} + \frac{3(\frac{d}{2} - x)}{\left[(\frac{d}{2} - x)^2 + b^2 \right]^{5/2}} \right\}.$$

Use Eq. (6-38)

At the midpoint,
$$x = 0$$
, $\frac{dBx}{dx} = 0$.

c)
$$\frac{d^{2}R_{x}}{dx^{2}} = -\frac{3NN_{0}Ib^{2}}{2} \left\{ \frac{1}{\left[\left(\frac{d}{2} + x \right)^{2} + \left[b^{2} \right]^{5/2}} - \frac{5\left(\frac{d}{2} + x \right)^{2}}{\left[\left(\frac{d}{2} + x \right)^{2} + b^{2} \right]^{7/2}} \right\}$$

$$\frac{d b_{\nu}}{d x^{2}} = -\frac{3N/d_{0}Lb^{2}}{2} \left\{ \frac{1}{\left[\left(\frac{d}{2} + x \right)^{2} + \left(x^{2} \right)^{5/2}} - \frac{5\left(\frac{d}{2} + x \right)^{2} + b^{2} \right]^{7/2}}{\left[\left(\frac{d}{2} + x \right)^{2} + b^{2} \right]^{5/2}} + \frac{1}{\left[\left(\frac{d}{2} - x \right)^{2} + b^{2} \right]^{5/2}} - \frac{5\left(\frac{d}{2} - x \right)^{2}}{\left[\left(\frac{d}{2} - x \right)^{2} + b^{2} \right]^{5/2}} \right\}.$$

$$\frac{1}{\left[\left(\frac{d}{2}-x\right)^{2}+b^{2}\right]^{5/2}} - \frac{5\left(\frac{d}{2}-x\right)^{2}}{\left[\left(\frac{d}{2}-x\right)^{2}+b^{2}\right]^{7/2}}\right\}.$$
At $x=0$, $\frac{d^{2}\beta_{x}}{dx^{2}} = -3N\mu_{0}Tb^{2}\left\{\frac{b^{2}-4\left(d/2\right)^{2}}{\left[\left(d/2\right)^{2}+b^{2}\right]^{7/2}}\right\} \rightarrow 0$, if $b=d$.