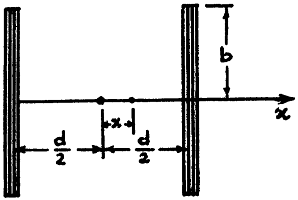
P.6-12 Use Eq. (6-38) $B_x = \frac{N\mu_0 I b^2}{2}\left\{\frac{1}{[(\frac{d}{2}+x)^2+b^2]^{3/2}} - \frac{1}{[(\frac{d}{2}-x)^2+b^2]^{3/2}}\right\}$.



a) At $x=0$, $B_x = \frac{N\mu_0 I b^2}{[(\frac{d}{2})^2+b^2]^{3/2}}$.

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

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

c) $$\frac{d^2B_x}{dx^2} = -\frac{3N\mu_0 I b^2}{2}\left\{\frac{1}{[(\frac{d}{2}+x)^2+b^2]^{5/2}} - \frac{5(\frac{d}{2}+x)^2}{[(\frac{d}{2}+x)^2+b^2]^{7/2}} + \frac{1}{[(\frac{d}{2}-x)^2+b^2]^{5/2}} - \frac{5(\frac{d}{2}-x)^2}{[(\frac{d}{2}-x)^2+b^2]^{7/2}}\right\}.$$

At $x=0$, $\frac{d^2B_x}{dx^2} = -3N\mu_0 I b^2\left\{\frac{b^2-4(d/2)^2}{[(d/2)^2+b^2]^{7/2}}\right\} \longrightarrow 0$, if $b=d$.