$$\frac{d^2B(z)}{dz^2} = -3\mu_0 NIa^2 \left[\frac{a^2-4b^2}{(b^2+a^2)^{7/2}}\right]$$

put $b = a/2$

$$\frac{d^2B(z)}{dz^2} = -3\mu_0 NIa^2 \left[\frac{a^2 - 4(a/2)^2}{[(a/2)^2+a^2]^{7/2}}\right]$$

$$\frac{d^2B(z)}{dz^2} = -3\mu_0 NIa^2 \left[\frac{a^2-a^2}{[(a^2/4)+a^2]^{7/2}}\right]$$

$$\frac{d^2B(z)}{dz^2} = -3\mu_0 NIa^2 \left[\frac{0}{\left[\frac{a^2+4a^2}{4}\right]^{7/2}}\right]$$

$$\frac{d^2B(z)}{dz^2} = 0$$

Now Take the distance between helmholtz coil Equal to their radius. Then magnetic field vanishes. The Magnetic Induction at Mid point is

$$B(z) = \frac{N\mu_0 Ia^2}{2}\left\{\frac{1}{(z^2+a^2)^{3/2}} + \frac{1}{[(2b-z)^2+a^2]^{3/2}}\right\}$$

put $z = b$

$$B(z) = \frac{N\mu_0 Ia^2}{2}\left\{\frac{1}{(b^2+a^2)^{3/2}} + \frac{1}{[(2b-b)^2+a^2]^{3/2}}\right\}$$

(2.3)

$$B(z) = \frac{N\mu_0 I a^2}{2}\left\{\frac{1}{(b^2+a^2)^{3/2}} + \frac{1}{(b^2+a^2)^{3/2}}\right\}$$

$$B(z) = \frac{N\mu_0 I a^2}{\cancel{2}}\left[\frac{\cancel{2}}{(b^2+a^2)^{3/2}}\right]$$

$$B(z) = N\mu_0 I a^2\left[\frac{1}{(b^2+a^2)^{3/2}}\right]$$

Put $b = a/2$

$$B(z) = N\mu_0 I a^2\left[\frac{1}{\left[(a/2)^2+a^2\right]^{3/2}}\right]$$

$$B(z) = N\mu_0 I a^2\left[\frac{1}{\left(\frac{a^2}{4}+a^2\right)^{3/2}}\right]$$

$$B(z) = N\mu_0 I a^2\left[\frac{1}{\left[\frac{a^2+4a^2}{4}\right]^{3/2}}\right]$$

$$B(z) = N\mu_0 I a^2\left[\frac{(4)^{3/2}}{(5a^2)^{3/2}}\right]$$

$$B(z) = N\mu_0 I a^2\left[\frac{(2^2)^{3/2}}{(5)^{3/2}(a^2)^{3/2}}\right]$$

$$B(z) = N\mu_0 I \cancel{a^2}\left[\frac{2^3}{5^{3/2}\,a^{\cancel{3}}}\right]$$

$$B(z) = \frac{N\mu_0 I}{a}\,\frac{8}{5^{3/2}}$$

This is M-I at Mid point of a Helmholtz coil