

40. (a) From Sample Problem 32-3 we know that $B \propto r$ for $r \leq R$ and $B \propto r^{-1}$ for $r \geq R$. So the maximum value of B occurs at $r = R$, and there are two possible values of r at which the magnetic field is 75% of B_{\max} . We denote these two values as r_1 and r_2 , where $r_1 < R$ and $r_2 > R$. Then $0.75B_{\max}/B_{\max} = r_1/R$, or $r_1 = 0.75R$; and $0.75B_{\max}/B_{\max} = (r_2/R)^{-1}$, or $r_2 = R/0.75 = 1.3R$.
- (b) From Eqs. 32-39 and 32-41,

$$B_{\max} = \frac{\mu_0 i_d}{2\pi R} = \frac{\mu_0 i}{2\pi R} = \frac{(4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}) (6.0 \text{ A})}{2\pi(0.040 \text{ m})} = 3.0 \times 10^{-5} \text{ T} .$$