Answer on Question #63012 – Math – Differential Equations

Question

The general solution of
d2B/dr2+dB/rdr-B/a^2 =0
is B=C Io(r a) +D Ko(r/a)
In our particular case the solution is Ko.
How we get
B= (h/2 phi a^2) Ko(r/a)
Where h= magnetic flux= Integral B d2r. Phi=3.14. And a=(m/meu. n e^2) ½

Solution

If the solution has to be $B = DK_0\left(\frac{r}{a}\right)$, then constant of integration usually can be found by applying boundary conditions. But if boundary conditions are not given, then we can find D as the mean value of B passing through the given region. If the region is a circle with the radius a, then the mean value is

$$B_m = \frac{\int BdS}{S} = \frac{\int BdS}{\pi a^2}$$

Then we get:

$$B = \frac{\int BdS}{\pi a^2} K_0\left(\frac{r}{a}\right)$$

Answer: $B = \frac{\int BdS}{\pi a^2} K_0\left(\frac{r}{a}\right)$.