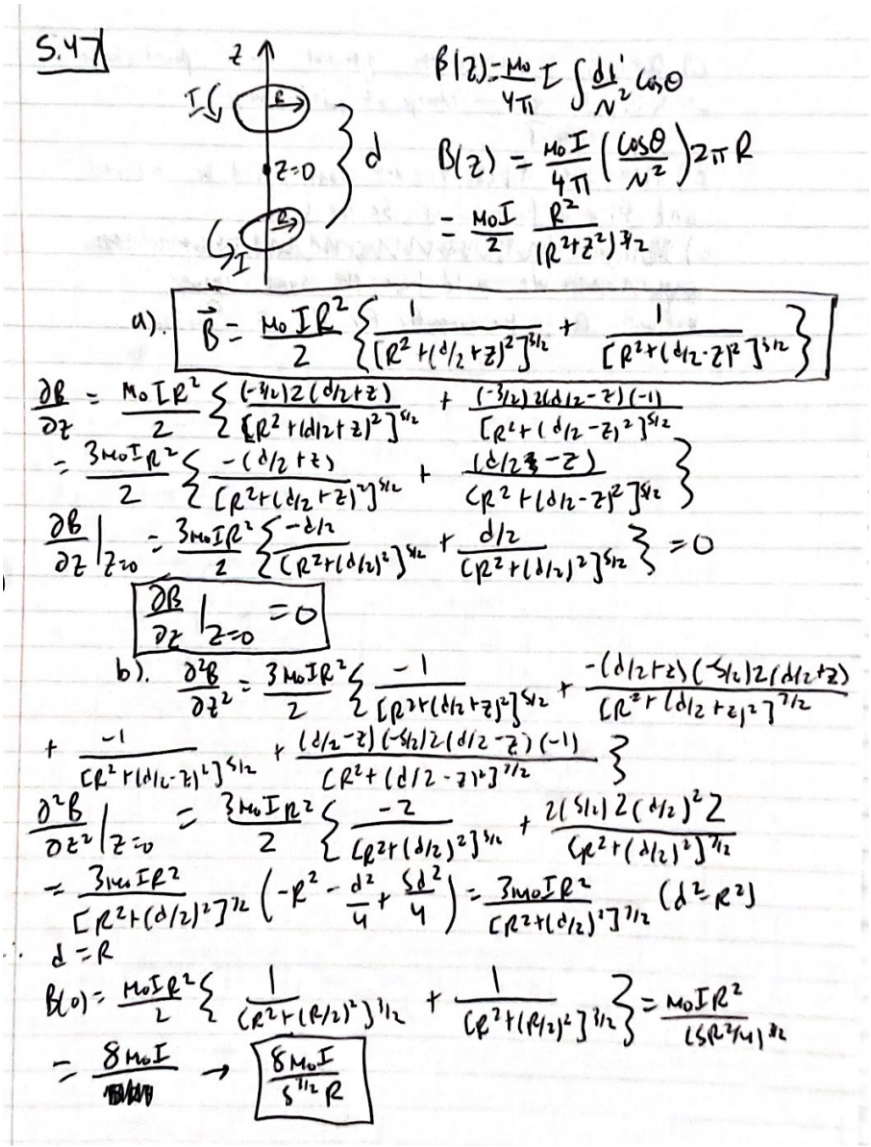
Problem 1



Part c

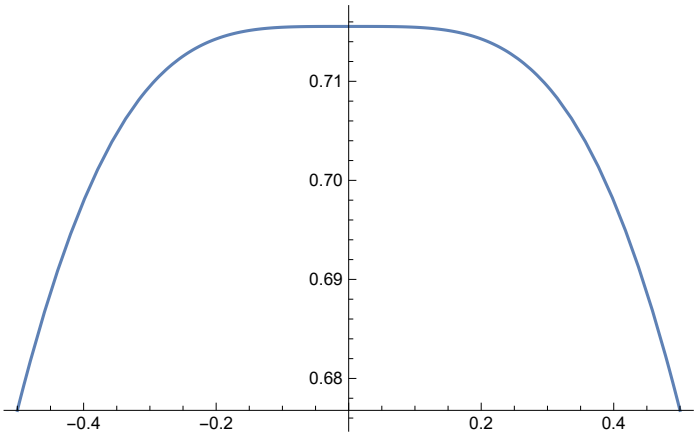
In[10]:=
```
R = 1;
Ic = 1;
u0 = 1;
```

In[13]:=
$$\text{MagField} = \frac{(u0 * Ic * R^2)}{2} * \left(\frac{1}{\left(R^2 + \left(\frac{R}{2} + z\right)^2\right)^{\frac{3}{2}}} + \frac{1}{\left(R^2 + \left(\frac{R}{2} - z\right)^2\right)^{\frac{3}{2}}} \right)$$

Out[13]=
$$\frac{1}{2}\left(\frac{1}{\left(1 + \left(\frac{1}{2} - z\right)^2\right)^{3/2}} + \frac{1}{\left(1 + \left(\frac{1}{2} + z\right)^2\right)^{3/2}} \right)$$

In[15]:=
```
Plot[MagField, {z, -R/2, R/2}]
```

Out[15]=



Problem 2

```
deltau = (40 * Pi)/200;

deltalx = -Sin[u] * deltau;
deltaly = Cos[u] * deltau;
deltalz = (0.05/Pi) * deltau;
deltal = {deltalx, deltaly, deltalz};
rx = x - Cos[u];
ry = y - Sin[u];
rz = z - 0.05/Pi * u;
r = {rx, ry, rz};
```

In[8]:=
```
B = Sum[u0 * Ic/(4 * Pi) * (Cross[{-Sin[u] * deltau, Cos[u] * deltau, (0.05/Pi) * deltau},
    {x - Cos[u], y - Sin[u], z - 0.05/Pi * u}] /
  (Norm[{x - Cos[u], y - Sin[u], z - 0.05/Pi * u}])^3), {u, -20 * Pi, 20 * Pi, deltau}]
```

Out[8]=

$$\left\{\frac{-0.628319-0.01\,y+\frac{\pi z}{5}}{4\pi\left(\text{Abs}[-1+x]^2+\text{Abs}[y]^2+\text{Abs}[-1.+z]^2\right)^{3/2}}+\cdots 199 \cdots+\frac{0.628319-0.01\,y+\frac{\pi z}{5}}{4\pi\left(\text{Abs}[-1+x]^2+\text{Abs}[y]^2+\text{Abs}[1.+z]^2\right)^{3/2}},\right.$$

$$\cdots 1 \cdots,\ \frac{\frac{\pi}{5}-\frac{\pi x}{5}}{4\pi\left(\text{Abs}[-1+x]^2+\text{Abs}[y]^2+\text{Abs}\left[\cdots 1 \cdots\right]^2\right)^{3/2}}+\frac{\frac{\pi}{5}-\frac{\pi x}{20}-\frac{\pi x}{4\sqrt{5}}+\frac{1}{5}\sqrt{\frac{5}{8}-\frac{\sqrt{5}}{8}}\,\pi y}{4\pi\left(\text{Abs}\left[\cdots 1 \cdots\right]^2+\cdots 1 \cdots^2+\cdots 1 \cdots^2\right)^{3/2}}+$$

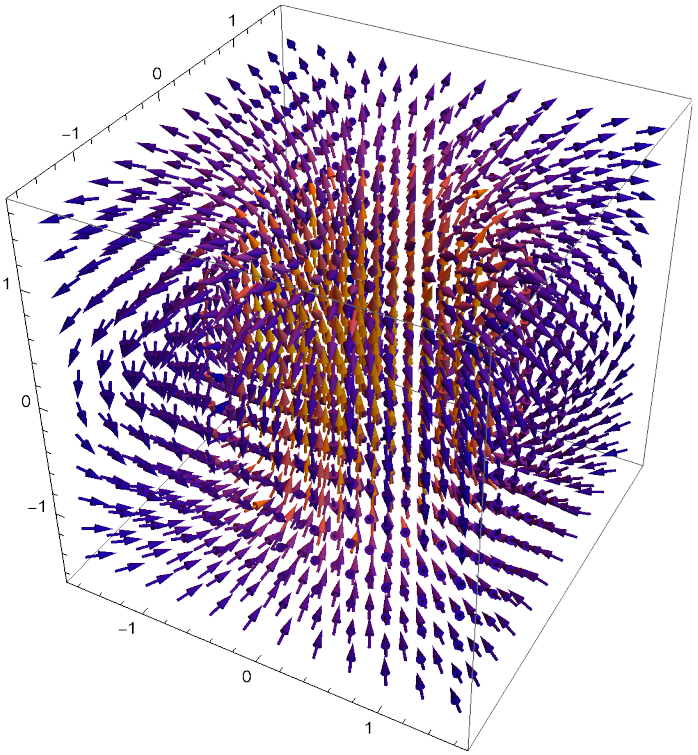
$$\frac{\frac{\pi}{5}+\frac{\cdots 1 \cdots}{20}-\cdots 1 \cdots+\frac{1}{5}\sqrt{\frac{5}{8}+\cdots 1 \cdots}\,\pi y}{4\pi\left(\cdots 1 \cdots\right)^{3/2}}+\cdots 195 \cdots+\frac{\cdots 1 \cdots}{\cdots 1 \cdots}+$$

$$\left.\frac{\frac{\pi}{5}-\frac{\pi x}{20}-\frac{\pi x}{4\sqrt{5}}-\frac{1}{5}\sqrt{\frac{5}{8}-\frac{\sqrt{5}}{8}}\,\pi y}{4\pi\left(\cdots 1 \cdots\right)^{3/2}}+\frac{\frac{\pi}{5}-\frac{\pi x}{5}}{4\pi\left(\text{Abs}\left[\cdots 1 \cdots\right]^2+\cdots 1 \cdots^2+\text{Abs}\left[\cdots 1 \cdots\right]^2\right)^{3/2}}\right\}$$

large output | show less | show more | show all | set size limit...

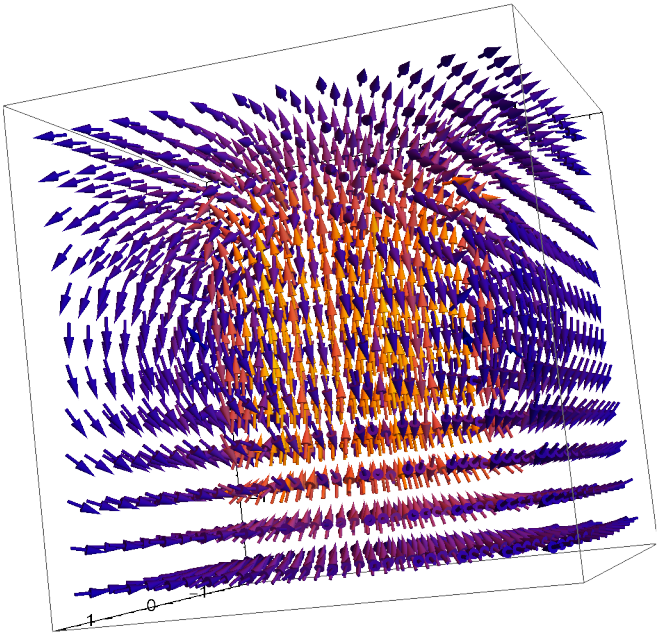
In[9]:=
```
VectorPlot3D[B, {x, -1.5, 1.5}, {y, -1.5, 1.5}, {z, -1.5, 1.5}, VectorPoints → {12, 12, 12}]
```

Out[9]=



In[6]:=
```
VectorPlot3D[B, {x, -1.5, 1.5}, {y, -1.5, 1.5}, {z, -1.5, 1.5}, VectorPoints → {12, 12, 12}]
```

Out[6]=



In[7]:=
```
VectorPlot3D[B, {x, -1.5, 1.5}, {y, -1.5, 1.5}, {z, -1.5, 1.5}, VectorPoints → {12, 12, 12}]
```

Out[7]=