Defining Separatrices of Penning Traps with Strong Magnetic Mirrors

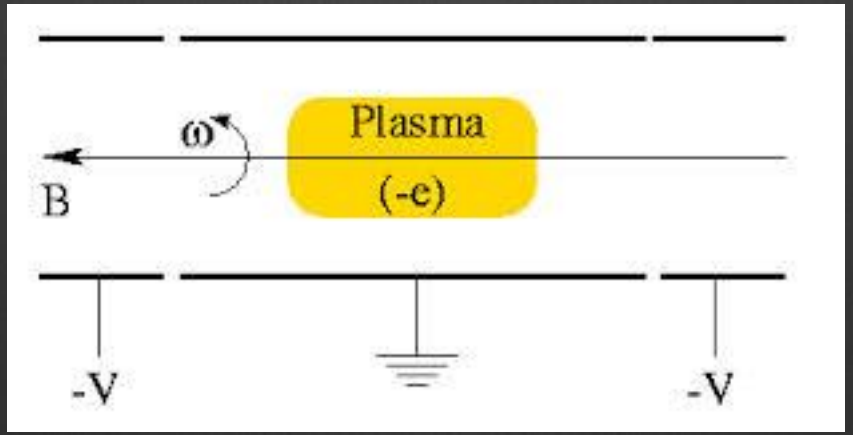
Stephanie (Alex) Brown

AEgIS
(Antihydrogen Experiment: Gravity, Interferometry, Spectroscopy)

- The main goal of AEgIS is to see how gravity interacts with antimatter
- Antimatter does seem to have some differences from matter

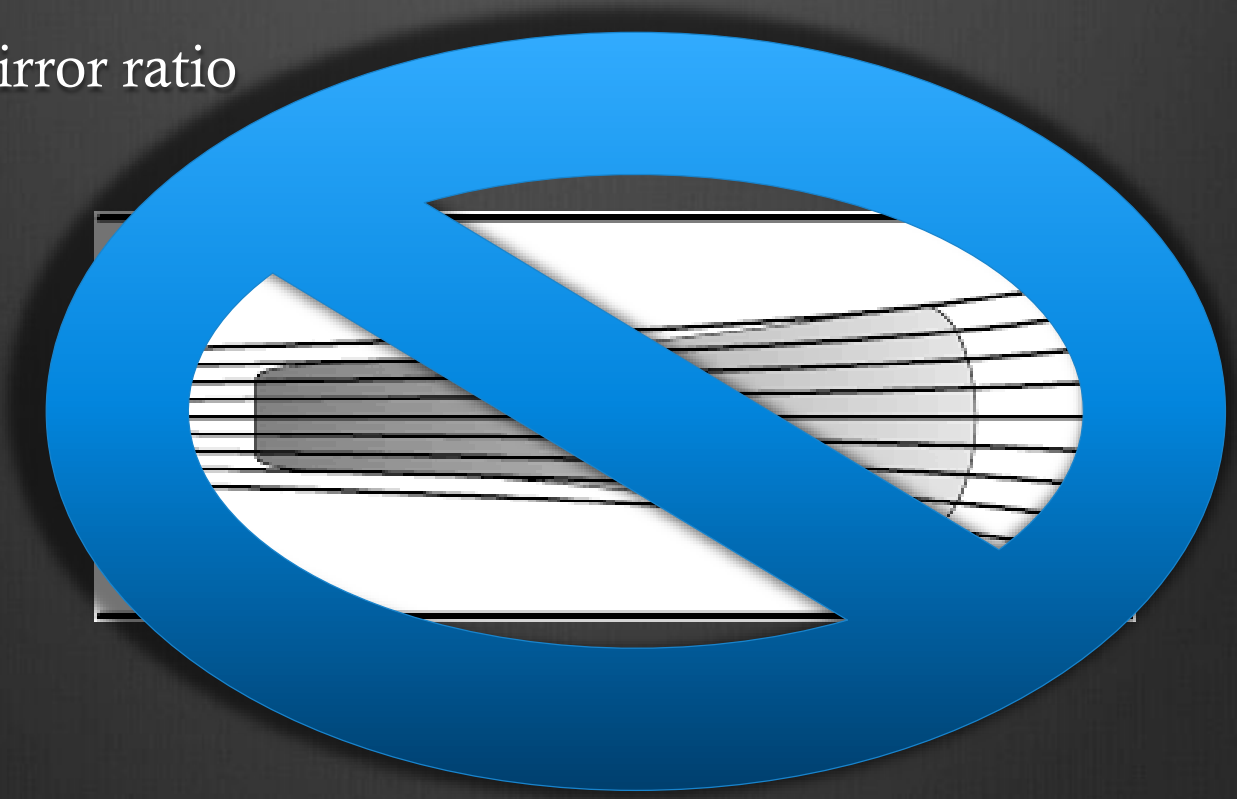
Holding Antihydrogen Plasma

- Magnetic traps in a vacuum are used to hold Antimatter
- We are using a Penning Trap with a magnetic mirror

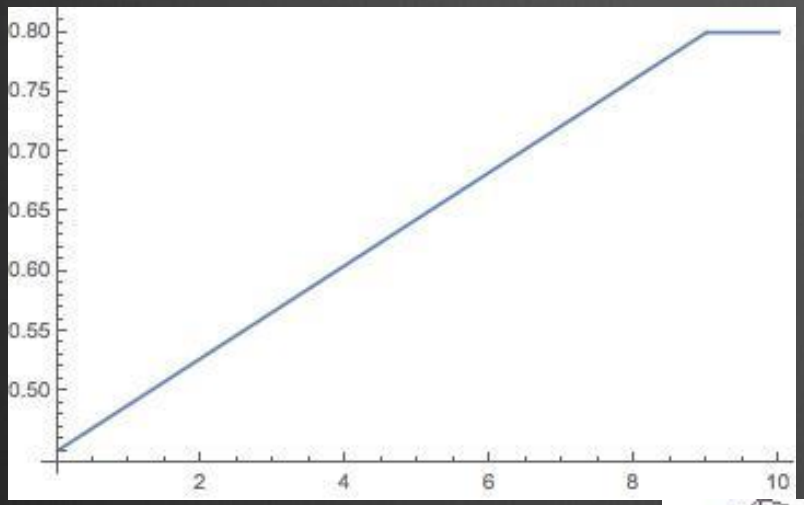


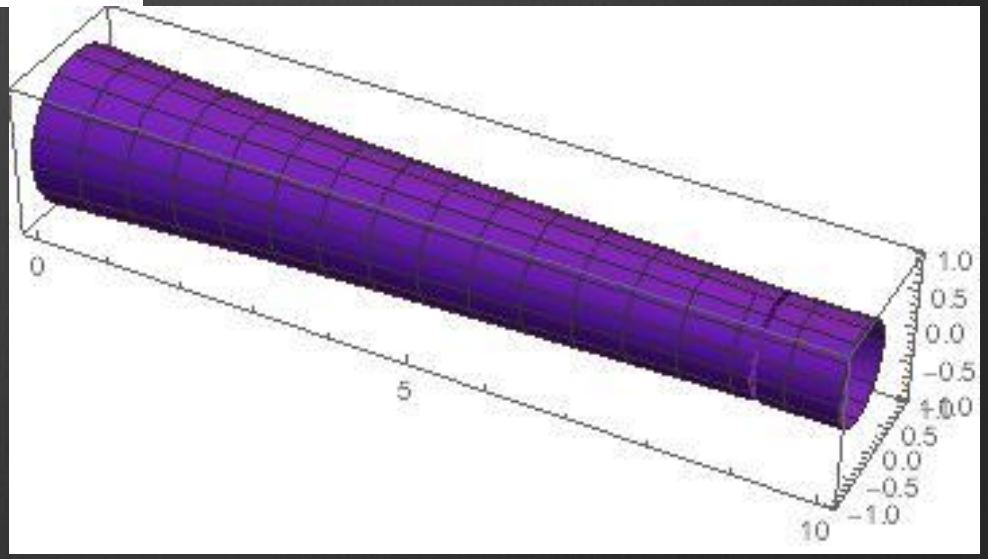
Problems?

- Magnetic Mirrors
- High mirror ratio



Enter: Summer Student





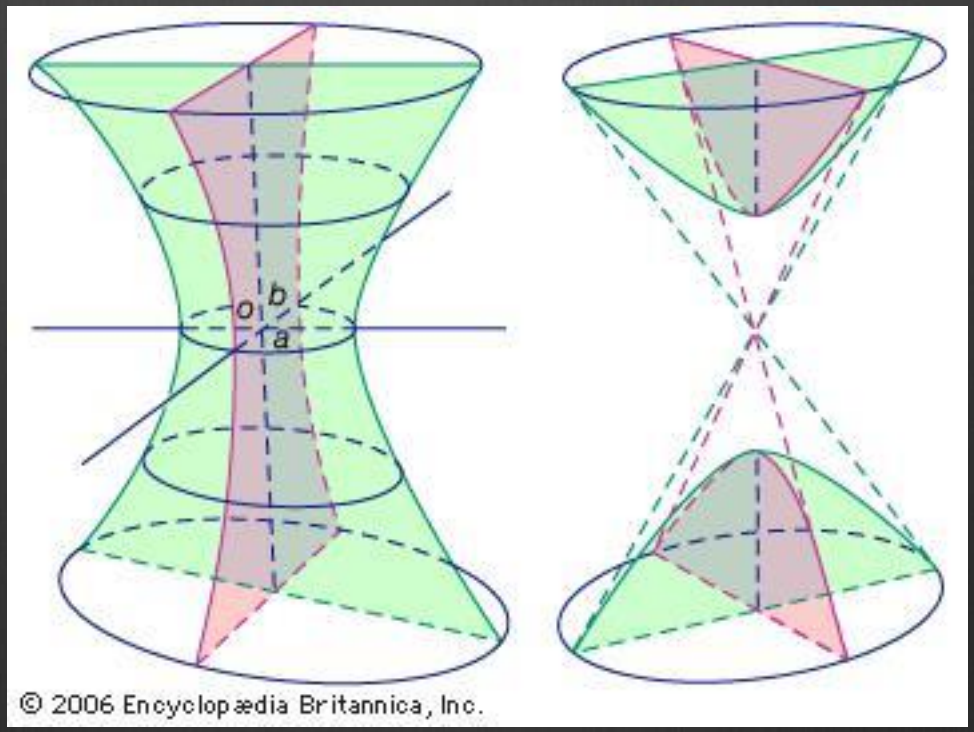
So the usual suspects are out…

In[34]:=
$$\text{DSolve}\left[\left\{-4\, e^{-\frac{1}{2} m r^2 \left(\frac{B e}{c m}-\omega\right) \omega - e \phi[r,z]}\, \pi + \frac{\phi^{(1,0)}[r, z]}{r} == 0,\ \phi[0, 0] == 0,\ \phi[\text{Rwall}, z] == 0\right\},\ \phi[r, z],\ \{r, z\}\right]$$

Out[34]=
$$\text{DSolve}\left[\left\{-4\, e^{-\frac{1}{2} m r^2 \left(\frac{B e}{c m}-\omega\right) \omega - e \phi[r,z]}\, \pi + \frac{\phi^{(1,0)}[r, z]}{r} == 0,\ \phi[0, 0] == 0,\ \phi[\text{Rwall}, z] == 0\right\},\ \phi[r, z],\ \{r, z\}\right]$$

Next?

- Separatrix!
- These define the border of two regions:



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