**Reading assignment**
Popović and Popović, 12.4 – 19.8 (through Eqn. 19.52)
Connor and Salon   VI-13 – VI-17, VII-19 – VII-21

**Problem 1 - Flux**
If the flux through surface $S_1$ in the figure below is $10^{-5}$ Webers, what is the flux through surface $S_2$?

![Diagram of magnetic field lines showing two surfaces $S_1$ and $S_2$ bounded by the same field lines.](image)
Problem 2 - Flux and magnetic vector potential
Take the same solenoid as used last class. The current density, $J = J_0 a_\phi$ for $a < r < b$ and is 0 everywhere else. In the previous class, we found that

$$B = \mu_0 J_0 (b - r) a_z$$
for $a \leq r \leq b$

$$0$$
for $b \leq r$.

a. Calculate the flux of $B$ through a circle of radius $a$ using $\psi = \int B \cdot ds$.

b. Show that $B = \nabla \times A$ if the magnetic vector potential, $A$ is given by:

$$A = \mu_0 J_0 (r b/ 2 - r^2/ 3 - a^3/ 6r) a_\phi$$
for $a \leq r \leq b$

$$\mu_0 J_0 (b^3 - a^3)/ 6r a_\phi$$
for $b \leq r$.

c. Calculate $\int A \cdot dl$ around a circle of radius $a$.
Compare your answer with part a.