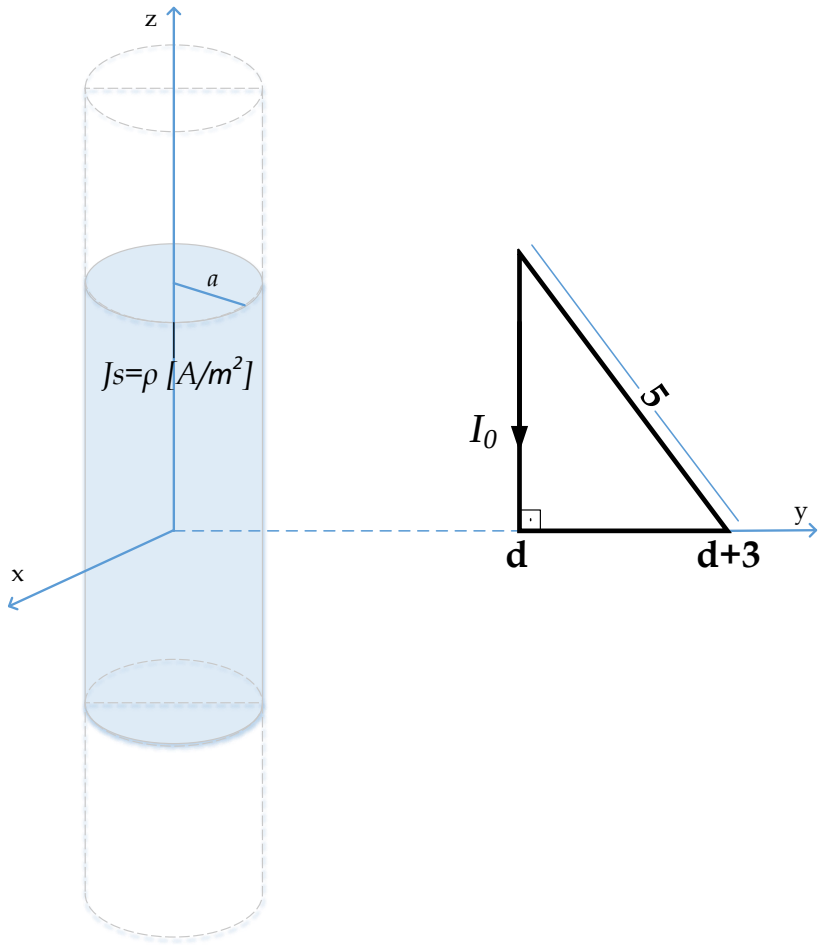
Homework 3 Due to the Final Exam

1- (70 pts)



An infinitely long wire with radius *a*, carrying a current with surface current density vector $\vec{J_s} = \rho \vec{a}_z$, is centered on the *z- axis* where ρ is the radial distance from the z axis.

a) (20 pts) Determine the magnetic field in whole space?

b) (50 pts) Determine the *net* force experienced by the current carrying conducting triangle loop?

2- (30 pts) An electromagnetic field propagates in source-free vacuum ($\vec{J} \equiv 0, \rho_v \equiv 0$). Show that $\vec{E}$ and $\vec{H}$ vectors, given below, satisfy these conditions? ($k = \omega\sqrt{\mu_0 \varepsilon_0}$)

$$\vec{E} = \cos(kx - \omega t)\, \vec{a}_z$$

$$\vec{H} = -\sqrt{\frac{\varepsilon_0}{\mu_0}} \cos(kx - \omega t)\, \vec{a}_y$$