

Extra credit problems. Math 3150-001. Spring 2015

Due Friday, April 17

Your name (please, print)

1. A homogeneous current

$$\mathbf{j} = j_0[1, 0]$$

flows through an infinite conducting plane of conductivity $k_0 = 1$.

A circular inclusion of radius r and of conductivity $k_i = 10$ is placed in the plane and distorts the current. An annulus $1 \leq r \leq c$ of conducting material ($k_a = 0.1$) (a cloak) must be placed around the circle, so that the inclusions become "invisible" that is the current everywhere outside the annulus is equal to \mathbf{j} .

Find the radius of that cloak. **(20 points)**

2. A homogeneous current

$$\mathbf{j} = j_0[0, 0, 1]$$

flows through an infinite conducting space of conductivity $k_0 = 1$.

A spherical inclusion of radius r and of conductivity $k_i = 10$ is placed in the space and distorts the current. A spherical layer $1 \leq r \leq c$ of conducting material ($k_a = 0.1$) (a cloak) must be placed around the inclusion, so that the inclusions become "invisible" that is the current everywhere outside the annulus is equal to \mathbf{j} .

Find the radius of that 3d cloak. **(40 points)**