## Physics 1215 Group Problem

A very long cylindrical shell of radius *a* shares the same axis with another long cylindrical shell of radius *b*, *b*>*a*. The inner shell has a total charge per unit area of  $\sigma = q/A$ , while that of the outer shell is  $-\sigma = -q/A$ . Both charges are uniformly distributed over the entire length of the cylinders.

- Ignoring any fringe effects at the end of the cylinders, find the electric field for (i) *r*<*a*, (ii) *a*<*r*<*b*, and (iii) *r*>*b*.
- 2) Find the electric potential difference between (i)  $\infty$  and *b*, (ii) *b* and *a*, and (iii) *a* and the axis of the cylinders. (Assume  $V(\infty) = 0$ ).
- 3) Suppose that instead of having equal and opposite charge per unit area on each cylinder, the cylinders have equal and opposite charge per unit length,  $\lambda = q/L$ . In this case, (i) what is the electric field for r > b? What is the electric potential between  $\infty$  and b?

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