Special Problem 5-4.2

A conducting plate lies on the half-plane $\phi = 0$. It has an electric potential of 5V.

Another conducting plate lies on the half-plane $\phi = 90^\circ$. It has an electric potential of -5V.

Filling the volume between the plates is a dielectric wedge with a relative permittivity of 3.0. The plates are not touching, but extend to infinity in both the $\hat{a}_p$ and $\hat{a}_z$ directions (sort of like an infinite door hinge!).

Find:

1. The electric potential field $V(\vec{r})$ within the dielectric.
2. The electric field within the dielectric.
3. The electric flux density within the dielectric.
4. The surface charge density on each plate.

**BIG HINT:** The electric potential field is a function of $\phi$ only (e.g., $V(\vec{r}) = V(\phi)$).