## Capacitance of 2 Cylinders

(a) Suppose that you have two parallel line charges, one with charge per unit length $\lambda$, and one with charge per unit length $-\lambda$. Let the distance of separation between them be $d$.


Show that the equipotential curves (in the plane) are circles, and relate their radius and center to $\lambda$, $d$, and the potential $\varphi$.
(b) Use the result of part (a) to show that the capacitance per unit length of two parallel right cylinders of radii $a$ and $b$, separated by a distance $d>a+b$, is given by

$$
C=\left[\frac{1}{2 \pi} \operatorname{arccosh} \frac{d^{2}-a^{2}-b^{2}}{2 a b}\right]^{-1} .
$$



