Special Problem 4-6.3

Consider the electric field:

$$\mathbf{E}(\bar{r}) = (3r\,\sin\theta - 2\cos\phi)r\,\hat{a}_r$$
$$+ \cos\theta\left(r^{-1}\sin\phi\,\tan\theta - r^2\right)\hat{a}_\theta$$
$$+ \left(\frac{\cos\phi\,\cot\theta}{r} + r\sin\phi\,\csc\theta\right)\hat{a}_\phi \quad \left[\frac{V}{m}\right]$$

Determine the electric **potential difference** between point $P_1(r=1$, $\theta=30°$, $\phi=0)$ and point $P_2(r=2$, $\theta=30°$, $\phi=0)$.

Hint #1: Do **not** attempt to find the electric potential function $V(\bar{r})$!

Hint #2: Do **not** attempt to express $\mathbf{E}(\bar{r})$ in some other coordinate system !