3.33

a) $(a,0,0) \Leftrightarrow r=a,\ \theta=\frac{\pi}{2},\ \phi=0$

$\vec{F}=q\vec{E}=q\frac{p}{4\pi\varepsilon_0 a^3}\hat{\theta}$, $V(a,0,0)=0$

b) $(0,0,a) \Leftrightarrow r=a,\ \theta=0$

$\vec{F}=q\vec{E}=q\frac{2p}{4\pi\varepsilon_0 a^3}\hat{r}$, $V(0,0,a)=\frac{p}{4\pi\varepsilon_0 a^2}$

c) $W=q(V(0,0,a)-V(a,0,0))=\frac{qp}{4\pi\varepsilon_0 a^2}$

3.34 Step 1: calculate the dipole:

$\vec{p}=-q(a\hat{y})+q(a\hat{z})+(-q)(-a\hat{y})=qa\hat{z}$

Step 2: calculate the dipole potential:

$V_{dip}=\frac{1}{4\pi\varepsilon_0}\frac{\vec{p}\cdot\hat{r}}{r^2}=\frac{1}{4\pi\varepsilon_0}\frac{qa\cos\theta}{r^2}$

Step 3: calculate $\vec{E}$ using the fact that $\vec{E}=-\vec{\nabla}V$

Recognizing that with $qa=p$, $V_{dip}$ is the same as eq. 102, we can skip the tedious differentiations and get

$\vec{E}\approx\frac{qa}{4\pi\varepsilon_0 r^3}(2\cos\theta\hat{r}+\sin\theta\hat{\theta})$