(1) (10 points) Griffiths, Problem 3.18.

(2) (10 points) Griffiths, Problem 3.22.

(3) (10 points).

(a) Show that:
\[ V = \frac{1}{|r - r'|} = \sum \frac{(r')^l}{r^{l+1}} P_l(\cos\gamma), \text{ if } |r| > |r'| \text{ and } \gamma \text{ is the angle between the vectors}. \]

(Hint, choose the z-axis along \( r' \). This sets a boundary condition for \( V \) at \( \gamma = 0 \). Find the coefficients \( A_l \) and \( B_l \) in the spherical coordinate expansion.)

(b) Write the exact potential for a true electric dipole drawn below in terms of Legendre polynomials in the region \( r > s \).

(c) What is the potential to lowest nonvanishing order when \( r >> s \).