“You remember how he discovered the North Pole; well, he was so proud of this that he asked Christopher Robin if there were any other Poles such as a Bear of Little Brain might discover. “There’s a South Pole,” said Christopher Robin, “and I expect there’s an East Pole and a West Pole, though people don’t like talking about them.”
Winnie the Pooh

4.1) Griffiths 6.5 (6 points)

4.2—4.3) Griffiths 6.7 and 6.9. Ignore the required comparison to 4.11. (3+6 points)

4.4) Griffiths 6.13 parts (b) and (c). (4 points)

4.5) A cube of magnetite is 5cm on an edge; it is magnetized to saturation in a direction perpendicular to two parallel faces. Find the magnitude in amperes of the surface current if the saturation magnetization is $4.8 \times 10^5 J/(T m^3)$? Would the field of this cube affect a compass placed 2m away from the center of the cube? (4 points)

4.6) Orient an octahedron so that the two opposite vertices are along the $z$ axis; place a magnetic dipole pointing along the $z$ direction at each of the vertices. Find the potential energy of this configuration. (3 points)

4.7) Extra credit Griffiths 6.25 (6 points) OR

Numerical: A dipole is placed on each of the white squares of a chessboard pointing up and one on each of the black squares pointing down. Compute the work required to remove any one of the dipoles to infinity (leaving the other 63 fixed) and thus determine which dipole is most tightly bound.