Name: ______________

Homework 2 **Due:** Start of class, September 14th

1. Griffiths Problem 1.55 (4th Edition; called 1.54 in the 3rd Edition) **[4pts]**
   Hints: $(\cos(x))^2 = \frac{1}{2}\cos(2x) + \frac{1}{2}$ *and* $(\sin(x))^2 = \frac{1}{2} - \frac{1}{2}\cos(2x)$.

2. Griffiths Problem 2.2 (only part (b) of the 3rd Edition) **[2pts]**
   Hints: Use visual symmetry to determine which field component(s) is/are non-zero.

3. Griffiths Problem 2.6 **[4pts]**
   Hints: Remember u-substitution; consider $u = s^2 + z^2$.

4. Griffiths Problem 2.12 **[3pts]**
   Hints: The problem is referring to the integral form of Gauss's Law.

5. Griffiths Problem 2.18 **[2pts]**
   Hints: Look at Griffiths's hint and recall superposition.

6. Griffiths Problem 2.21 **[3pts]**
   Hints: Since $r \to \infty$ is your reference point, the integral to find the potential inside of the sphere is best broken up into two integrals, one from ∞ to R and the other from R to r. Note that you found the field for the inner region in Griffiths Problem 2.12.

7. Griffiths Problem 2.28 **[3pts]**
   Hints: The law of cosines (i.e. the more general form of the Pythagorean theorem) can be used to find the length of the side of a triangle given two side lengths and the angle that is opposite to the side of interest: $c^2 = a^2 + b^2 - 2ab\cos\theta_c$. This can be used to get the distance between a point within a sphere to some point outside, e.g. on the z-axis.
   Do the integrals in order φ, θ, r and employ u-substitution for the θ integral.
   It turns out $\frac{1}{rz}\left(\sqrt{r^2 + z^2 + 2rz} - \sqrt{r^2 + z^2 - 2rz}\right) = \frac{2}{z} for\ r < z\ and\ \frac{2}{r}\ for\ r > z.$