Alginate is a biologically synthesized polymer that is commonly isolated from brown algae and is used as a food additive. With the addition of calcium ions, alginate solutions undergo gelation to form firm gels, which have potential as tissue scaffolds in biomedical applications. Alginate is also produced by *Pseudomonas aeruginosa* and composes a large portion of the extracellular polymeric substance (EPS) of biofilm. Certain mucoid strains, found in the lungs of cystic fibrosis patients, make particularly strong gels and may play a role in progression of the disease. The rheological behavior of alginate solutions and gels are not well understood. In this work, the material properties of algal and various strains of bacterial alginates were rheologically characterized with the aim of increasing understanding of alginate gelation for biomedical and biotechnology applications. Alginate solution underwent rheological characterization as a function of biopolymer concentration. Flow testing was conducted to obtain viscosity and shear thinning behavior was observed, as is typical of polymer solutions. Oscillatory measurements were made to discern the viscoelastic fluid properties of alginate solutions, the storage ($G'$) and loss ($G''$) moduli, corresponding to the elastic and viscous components of the fluid response respectively. With gelation there was an overall increase in the elastic component of the fluid response.