The complex eigenvalue equations of metal-clad graded-index waveguides are generally solved by numerical methods. The role of waveguide and material parameters in determining mode dispersion and attenuation becomes difficult to elucidate. We describe a perturbative method of solution which is suited to the class of waveguide in which the guided field is described analytically. Mode dispersion and attenuation are explicitly obtained. Applications to three commonly used waveguide models demonstrate the accuracy of our approach in comparison to numerically obtained results.