Amath 568 class topics to review for final exam

Perturbation theory

(1) Identifying regular vs. singular perturbation problems
(2) Regular perturbation series solutions
(3) Secular terms - when perturbation series break down
(4) Dominant balance for singular perturbation problems
(5) Boundary layers, inner, outer and matched solutions for singularly perturbed ODEs boundary value problems
(6) WKB theory for wave propagation and eigenvalue problems, including Airy function asymptotics at turning points.

Asymptotics near singular points of ODEs

(1) Identifying ordinary points and regular and irregular singular points, including behavior at infinity
(2) Taylor series around ordinary points, including expected region of convergence
(3) Asymptotic behavior and Frobenius series solutions around regular singular points, including expected region of convergence
(4) \( y = \exp(S(x)) \) and use of dominant balance to obtain asymptotic series near irregular singular points
(5) Properties of asymptotic series, including possible nonconvergence
(6) Asymptotics of integrals, including via integration by parts and stationary phase.