

## 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.