You should know the techniques and basic results associated with the following topics:

Analytic solutions to first order linear and separable differential equations

Linear systems
- Interpreting coefficients.
- Identify and classify equilibrium points
- Solutions for two distinct real eigenvalues, one real eigenvalue and two complex eigenvalues.
- Phase planes for different regions of the trace determinant plane
- Special cases: one or both eigenvalues are zero

Harmonic Oscillator
- Meaning of coefficients
- Solution of homogeneous equation using the characteristic polynomial (Free gift from the math department), for the three cases: two real values, one real value and two complex values
- Solution of the inhomogeneous equation using the method of undetermined coefficients.
- Find amplitude and phase of forced response
- Resonance in damped and undamped harmonic oscillator – recognize graphs.