**Methods of Solving Differential Equations:**

* **Separation of Variables**
  + Used when you can separate all the independent variables and their derivatives onto both sides of the equation
  + Ex. *dy = ky dx* -> *dy/y = k dx*
    - Integrate both sides -> *ln(y) +C = kx +D* (Combine constants)
    - Put both sides in base *e* -> *y = ekx+C*
    - Simplify -> *y=Cekx* (Combine constants)
* **Integrating Factor**
  + Used for equation in the form *y’(x)+P(x)=Q(x)*
  + Integrating Factor = e∫P(x)dx
  + General Solution: ye∫P(x)dx = C+ ∫ e∫P(x)dx f(x)dx
* **Power Series Method**
* **Laplace Transform**
  + Take Laplace Transform
    - Integration by parts (usually)
    - *L(f’(t)) = sL[f(t)]-f(0)*
  + Simplify in *s*
  + Take inverse Laplace Transform
* **Diagonalization**
  + *Y’=AY*
  + *Det(A-λI) = 0*