**Linear Transformations:**

* **Laplace Transform**
  + *f(s) =* ∫f(t)e-st dt (Integration from 0 -> inf)
* **Inverse Laplace Transform**
  + *f(t) =1/2π* ∫f(t)est ds
* **Fourier Transform**
  + *f(jὠ) = =* ∫f(t)e-jὠt dt (Integration from -inf -> inf), *ὠ(0) = 2πf*
* **Inverse Fourier Transform**
  + *f(t) = =1/2π* ∫f(*ὠ*)ejὠt d*ὠ*
* **Integration**
* **Differentiation**

**Linearity Test**

* A function *f(x)* is linear iff α*f(x) = f(*α*x)* ***AND*** *f(x1+x2) =* *f(x1) + f(x2)*

**Linear In/dependence**

* In order for X1 and X2…Xn to be linearly independent, there must **NOT** exist a set of scalars such that C1X1 +C2X2+…. CnXn = 0
  + In other words, it is impossible to make one variable using a linear combination of the other variables
    - The only possible way to satisfy the above equation (if linearly independent) is if all the scalars are 0.
    - How do we check this?
      * Make a system of equations, and reduce it using your favorite reduction method
        + Check value of scalars after reduction
* In order for X1 and X2…Xn to be linearly dependent, there **must** exist a set of scalars such that one variable can be represented as a linear combination of the other scalars (without making all the scalars 0).
  + E.g X1 = 2y, X2 = y: X1 and X2 are linearly dependent because X1 can be rewritten as 2X2 (C = 2), thus X1 is simply a linear combination of X2