Differential Equations Tables

Function $f(t) = L^{-1}\{F(s)\}$	**Laplace Transform** $F(s) = L\{f(t)\}$
1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

Table 1: Laplace transforms of basic functions.

Eigenvalues	**Type of Critical Point**	**Stability**
$r_1 > r_2 > 0$	Nodal Source (Node)	Unstable
$r_1 < r_2 < 0$	Nodal Sink (Node)	Asymptotically Stable
$r_2 < 0 < r_1$	Saddle Point	Unstable
$r_1 = r_2 > 0$, independent eigenvectors	Proper node/Star point	Unstable
$r_1 = r_2 < 0$, independent eigenvectors	Proper node/Star point	Asymptotically Stable
$r_1 = r_2 > 0$, missing eigenvector	Improper node	Unstable
$r_1 = r_2 < 0$, missing eigenvector	Improper node	Asymptotically Stable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda > 0$	Spiral point	Unstable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda < 0$	Spiral point	Asymptotically Stable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda = 0$	Center	Stable

Table 2: Overview of behavior of linear systems.

Eigenvalues of linear system	**Type of Critical Point**	**Stability**
$r_1 > r_2 > 0$	Nodal Source (Node)	Unstable
$r_1 < r_2 < 0$	Nodal Sink (Node)	Asymptotically Stable
$r_2 < 0 < r_1$	Saddle Point	Unstable
$r_1 = r_2 > 0$, independent eigenvectors	Node or Spiral Point	Unstable
$r_1 = r_2 < 0$, independent eigenvectors	Node or Spiral Point	Asymptotically Stable
$r_1 = r_2 > 0$, missing eigenvector	Node or Spiral Point	Unstable
$r_1 = r_2 < 0$, missing eigenvector	Node or Spiral Point	Asymptotically Stable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda > 0$	Spiral point	Unstable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda < 0$	Spiral point	Asymptotically Stable
$r_1 = \lambda + \mu i$, $r_2 = \lambda - \mu i$, $\lambda = 0$	Center or Spiral Point	Indeterminate

Table 3: Overview of behavior of almost linear systems.