**Differential Equation Formulas**

1. Homogeneous Case

$\frac{dy}{dt}+ay=0$

General Solution: $y\left(t\right)=Ae^{-at}$

Definite Solution: $y\left(t\right)=y(0)e^{-at}$

1. Non-homogeneous Case

$\frac{dy}{dt}+ay=b (b\ne 0)$

General Solution: $y\left(t\right)=Ae^{-at}+\frac{b}{a}$

Definite Solution: $y\left(t\right)=\left[y\left(0\right)-\frac{b}{a}\right]e^{-at}+\frac{b}{a}$

**Difference Equation Formulas**

1. The Homogeneous Case

$my\_{t+1}-ny\_{t}=0$

where $b=\frac{n}{m}$

General Solution: $y\_{t}=Ab^{t}$

Definite Solution: $y\_{t}=y\_{0}b^{t}$

1. The Non-Homogeneous Case

Part 1: $a\ne -1 ;c\ne 0$

$y\_{t+1}+ay\_{t}=c$

General Solution

$y\_{t}=A\left(-a\right)^{t}+\frac{c}{1+a}$

Definite Solution

$y\_{t}=\left[y\_{0}-\frac{c}{1+a}\right]\left(-a\right)^{t}+\frac{c}{1+a}$

1. The Non-Homogeneous Case

Part 2: $a=-1 ;c\ne 0$

$y\_{t+1}-y\_{t}=c$

General Solution

$y\_{t}=A+ct$

Definite Solution

$y\_{t}=y\_{0}+ct$