1. $x_t = r x_{t-1}(1 - x_{t-1})$

1. Find the eq points:

$$x_{eq} = r x_{eq}(1 - x_{eq})$$

$$r x_{eq} - r x_{eq}^2 - x_{eq} = 0$$

$$x_{eq}(r - r x_{eq} - 1) = 0$$

$$\left[\begin{array}{l} x_{eq} = 0 \\ r - r x_{eq} - 1 = 0 \end{array}\right. \Rightarrow \left[\begin{array}{l} x_{eq} = 0 \\ x_{eq} = \frac{r-1}{r} \end{array}\right.$$

We calculate $\frac{dF}{dt}\left[r x (1 - x)\right] = r - 2rx$

$$\left|\frac{dF}{dt}\right|_{x=0} = r - 2r * 0 = r$$

$$\left|\frac{dF}{dt}\right|_{x=\frac{r-1}{r}} = r - 2r\left(\frac{r-1}{r}\right) = r - 2(r-1) = r - 2r + 2 = 2 - r$$

Since this is a discrete-time model, the critical condition

for $\left|\frac{dF}{dt}\right|_{x = x_{eq}} = 1 \Rightarrow \left[\begin{array}{l} r = 1 \\ 2 - r = 1 \end{array}\right. \Rightarrow \boxed{r = 1}$

We can determine the stability at the eq point by checking the value of $\frac{dF}{dt}$ at each point

Eq point	$r < 1$	$r > 1$
$x_{eq} = 0$	$\lvert F'(x_{eq}) \rvert < 1 \rightarrow$ stable	$\lvert F'(x_{eq}) \rvert > 1 \rightarrow$ unstable
$x_{eq} = \frac{r-1}{r}$	$\lvert F'(x_{eq}) \rvert < 1 \rightarrow$ stable	$\lvert F'(x_{eq}) \rvert > 1 \rightarrow$ unstable