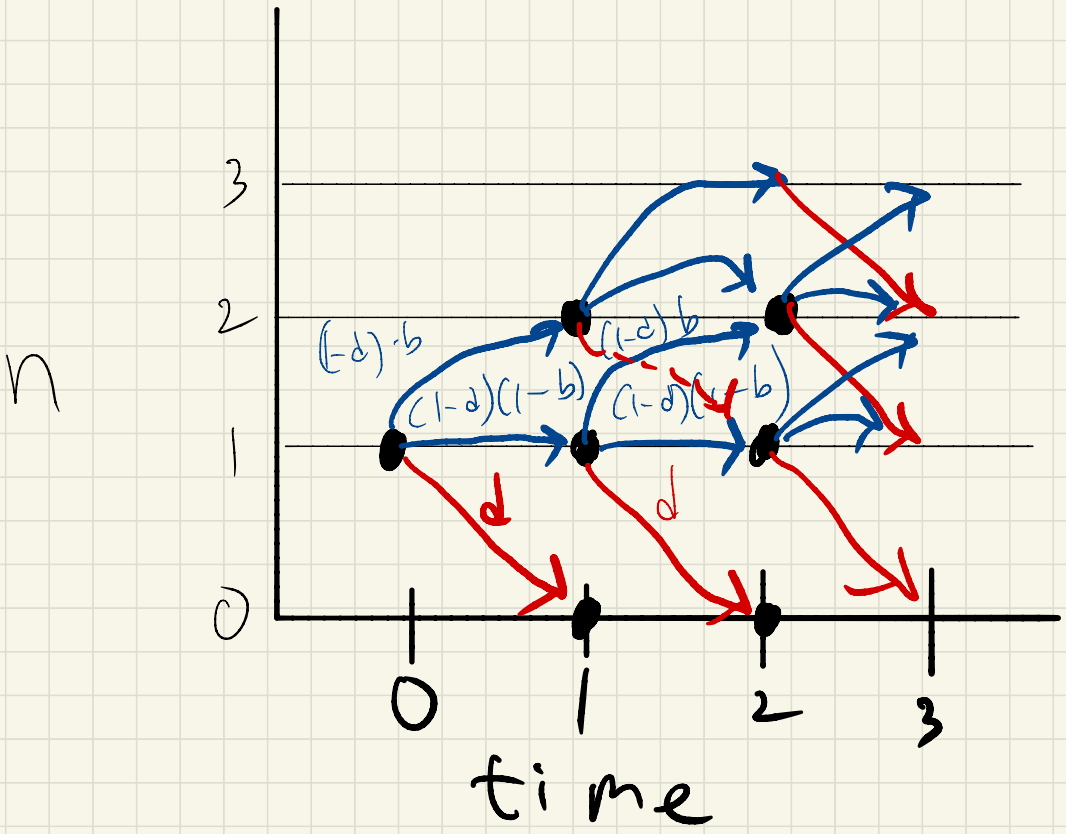
Invasion when births and deaths are random

$d \equiv$ prob of dying

$b \equiv$ prob of producing 1 baby



$E_1 \equiv$ Prob extinct starting with 1 individual

$$E_1 = d + (1-d)(1-b)E_1 + (1-d)bE_2$$

What is E_2? $E_2 = E_1 \cdot E_1$

$$E_1 = d + (1-d)(1-b)E_1 + (1-d)bE_1^2$$

$$(1-d)bE_1^2 + (db - d - b)E_1 + d = 0$$

$$(1-E_1)(d - b(1-d)E_1) = 0$$

$E_1 = 1$ or $E_1 = \dfrac{d}{b(1-d)}$

$$E_1 = \frac{d}{b(1-d)}$$

When is $E_1 < 1$

$$\frac{d}{b(1-d)} < 1$$

$b(1-d)$ = # new births

d = # new deaths

$$d < b(1-d)$$