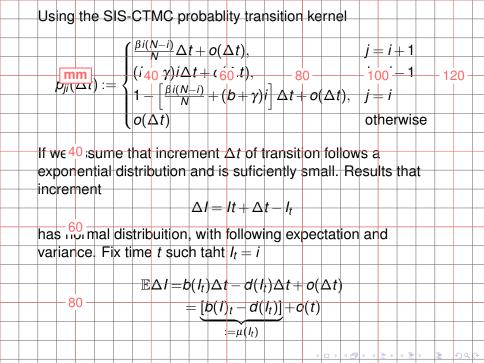


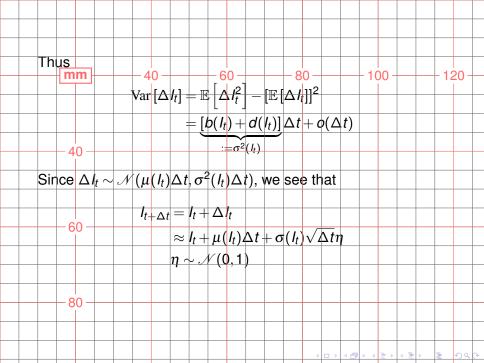
Let
$$\frac{mm}{r = x}$$
, $\Delta i = \Delta x$ and $pi(t) = p(x, t)$. Thus, letting $\Delta x = 0$, we obtain the FKE

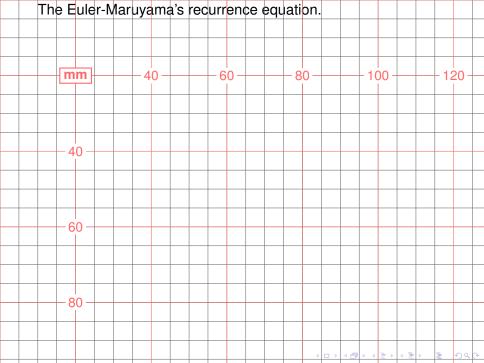
$$\frac{\partial p(x, t)}{\partial x} = \frac{\partial}{\partial x} \left\{ \left[b(x) - d(x) \right] p(x, t) \right\} + \frac{1}{2} \frac{\partial^2}{\partial t^2} \left\{ b(x) + d(x) p(x, t) \right\}$$

$$= \frac{\partial}{\partial x} \left\{ \left[\frac{beta}{N} x(N - x) + (\beta + \gamma)x \right] p(x, t) \right\}$$

$$= \frac{1}{2} \frac{\partial^2}{\partial x^2} \left\{ \left[\frac{\beta}{N} x(N - x) + (\beta + \gamma)x \right] p(x, t) \right\}$$







Further, becouse under this setting, the Euler-Maruyama converge. Letting
$$\Delta t \to 0$$
, we deduce our SIS-SDE:
$$dI_t = \mu(I_t) + \sigma(I_t)dW_t$$
 Sustituting, the notation for birth and death processes
$$dI_t = \frac{\beta}{N}I_t(N-I_t) + (b+\gamma)I_t + \sqrt{\frac{\beta}{N}I_t(N-I_t) + (b+\gamma)I_t}dW_t$$