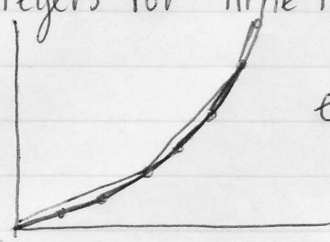
Both exponential and logistic models can be either continuous or discrete. What I just did was the continuous model for each.

Discrete means that births do not occur whenever, but only at distinct times, like during certain seasons. Thus, once all births occur, and all deaths during a certain period, a census is taken, and also the models are in the form of difference equations.

Difference equations are similar to differential equations, but you only use integers for time increments. It's based on the limit definition, so it is a good approximation for differential equations.



$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Instead of dN/dt, you have $\Delta N / \Delta t$

For exponential,

$$N_{(t+1)} = N_{(t)} + B - D \;, \text{so} \; N_{(t+1)} = N(t) + (b-d) N_{(t)} = N_{(t)} + r N_{(t)} = (1+r) N_{(t)}$$

Often seen as $N_{(t+1)} = \lambda N_{(t)}$, λ called Net Growth Ratio

If this is the case, then the population grows or decays geometrically; recursive and $N_{(t)} = \lambda^t N_0$.

This can be used in early stages of bacterial growth, sometimes for fish populations.

- Discrete difference equation for logistic model is derived same way as logistic differential one.

$$\Delta N = r_d N(t) \left(1 - \frac{N(t)}{K}\right)$$

This can be used for yeast and fish as well.

SO

Neither of these models is anywhere near perfect because they don't take into account age, male-female ratio, what percentage of females have offspring and at what age they can have children, and how many children each female has. It doesn't even take competition into account. ~~These are for~~ Also, for logistic model, if the growth rate is too high, more complex dynamics: damping oscillations, cycles, chaos, etc.

Thus, more complicated models are needed.