MB&B 562: Problem Set 1

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Question B(i)

(b)(i) At the fixed point,

$$\dot{x}(x^*) = 0$$

$$K\left(\frac{(x^*)^n}{x_M^n + (x^*)^n} + 0.1\right)(1 - x^*) = P x^*$$

So,

$$P(x^*) = K\left(\frac{(x^*)^n}{x_M^n + (x^*)^n} + 0.1\right)\left(\frac{1 - x^*}{x^*}\right)$$

Question D(i)

At lower values of T_end (amount of time for which the system evolves), the system spuriously shows stable (or unstable, for backwards ODE) fixed points at points on the y-axis where there aren't any. This is because the system is still evolving toward the stable (or unstable) fixed point; at the end of which, the points will have settled on the fixed point curve.

Experimenting with values of T_end, increasing it by 1 at each step, it appears that all systems, i.e. each with a different P value, reach their fixed points at about **T_end = 15**. I also set the value to a very high T_end of 1000 to cross-check and the plot does not appear any different than at 15, suggesting that the system has, in fact, reached its fixed point by T_end = 15.

The following is a plot at T_end = 10, showing points that are not on the fixed point curve.