1. Suppose a person takes a pill containing 200 mg of a drug every 4 hours. Assume that the body eliminates 20% of the drug in the bloodstream every 4 hours. Draw a box model and write a dynamical system which gives the amount of drug in the bloodstream after taking \( n \) pills in terms of the amount in the bloodstream after taking \( n - 1 \) pills. Does the amount in the bloodstream tend to 0, grow to a limit or grow unbounded?

2. Suppose you borrow $2000 from a friend. You agree to add 1% interest each month to the amount that is still outstanding (before any payment is subtracted). Set up a model (dynamical system) and either solve it analytically or computationally to find the answer to the following scenario:

Suppose you pay $150 per month. How long will it take for you to pay off this loan?

3. For each of the following dynamical systems, (a) Determine the fixed point(s), (b) determine if the fixed point is attracting, repelling or undetermined, and (c) sketch an appropriate cobweb graph for each fixed point to indicate its status as attracting or repelling or undetermined.

(a) \( x_{n+1} = 0.8x_n - 2 \)
(b) \( x_{n+1} = -1.2x_n + 3 \)
(c) \( x_{n+1} = x_n^2 - 6 \)

4. Let a population of wild deer be modeled by the DDS

\[
x_{n+1} = (1 + r)x_n - bx_n^2
\]

where \( x_n \) is the number of deer in year \( n \) and \( r >> b > 0 \) (\( >> \) means much greater than).

(a) Determine the value \( K > 0 \) such that if \( x_n = K \) then \( x_{n+1} = K \) (i.e. a positive fixed point).

(b) Calculate the growth rate \((x_{n+1} - x_n)/x_n\) when \( x_n = K/2 \).

(c) Suppose we decide to allow hunting in this population but limit it to a fraction \( h \) of the total population each year. This would modify the existing model by subtracting \( hx_n \) from the new population. Determine a hunting rate \( h \) so that when \( x_n = K/2 \) the growth rate is still \( \geq 0 \). Determine a second rate \( h \) so that when \( x_n = K/2 \) the growth rate is \( 1/2 \) of what it was with no hunting (from (b)).