Homework 2

In questions 1-4 assume that a certain drug has the property that 70% is retained in the body after 24 hours.

1. Suppose that a daily dose of 250 mg is given. Find a formula for the amount x_n of drug present in the body after the n-th dose.
2. A steady state dose of 600 mg is desired. What daily dose should be given?
3. Suppose that an initial dose of 500 mg is given, followed by daily doses of 250 mg. Find a formula for the amount x_n of drug present in the body after the n-th dose.
4. Suppose that an initial dose of 500 mg is given, and after the initial dose, a daily dose of M mg is given. Suppose again that a steady state dose of 600 mg is desired. What is M?
5. Suppose that the amount y_n of drug present in the body after n daily doses satisfies the updating rule:
$$\begin{cases} x_1 = 500 \\ x_n = 250 + .7\ (1 + \cos(\frac{2\pi n}{28}))\ x_n \end{cases}$$
Investigate the sequence x_n numerically and graphically, and find parameters A, B, C such that the formula
$$f(n) = A(1 + B\cos(\frac{2\pi(n - C)}{28}))$$
fits the data closely.
6. Find the range R of the function f described by
$$\begin{cases} f : \mathbb{R} \longrightarrow \mathbb{R} \\ f(x) = x^2 + 5x + 7 \end{cases}$$
7. Find the set of all real numbers a such that the equation
$$x^2 + 5x + a = 0$$
has at least one solution.