

Iterating Linear Functions: Explicit Formula

These questions are about iterating $f(x) = mx + b$. Seed: x_0 . Orbit: x_0, x_1, x_2, \dots

For each question, give examples and a symbolic answer.

1. What values of m and b yield
 - a. an arithmetic sequence?
 - b. a geometric sequence?
2. The fixed point:
 - a. find a formula for it
 - b. when does it not exist?
3. For what values of m and b is the fixed point
 - a. attracting?
 - b. repelling?
4. Find the differences ($d_0, d_1, d_2, d_3, \dots$) between successive iterates and the fixed point. What sort of sequence do you get? (arithmetic? if so, what is the common difference? geometric? if so, what is the common ratio? neither? Try this at least once with $m < 1$, and once with $m > 1$.)
5. Find a formula for d_n .
6. Find a formula for x_n .