

Math 241, Spring 2026 — Graphical analysis

Problem 1. For each of the following functions, describe the fate of orbits by drawing some cobweb diagrams by hand. Make sure to find fixed points. Assume the state space X is the set \mathbb{R} of all real numbers. Conclude by giving a complete orbit analysis and drawing a phase portrait. Once you have made some pictures by hand, you may use the Desmos plotter to help, but make sure you're comfortable doing this by hand for future quizzes and exams.

1. $F(x) = 2x$

2. $F(x) = \frac{1}{3}x$

3. $F(x) = 2x(1 - x)$

4. $F(x) = x^{1/3}$

Problem 2. Using the examples above, make a conjecture about the role that slope plays when studying the behavior of orbits that start near a fixed point.