Assignment 1 Math 456 Fall 2024
Deadline: Friday 27 September

Reading

Chaos, 1.1 - 1.3

Exercises

Write in concise, clear *sentences* (incorporating symbolic notation and computations). Submit to the class drop box on Canvas.

1) ***Chaos*:** 1.2 (p. 36)
2) For the following maps, find the periodic points and classify them as attracting, repelling, or indifferent. Using analytic and visual tools, describe the *global* dynamics such as basins of attraction.

   a) $x \longrightarrow \dfrac{1}{x+1} \qquad x \in \mathbf{R}$

   b) $x \longrightarrow \dfrac{x^2 - x}{2} \qquad x \in \mathbf{R}$

   c) $x \longrightarrow x - x^2 \qquad x \in \mathbf{R}$

   d) $x \longrightarrow \sin x \qquad x \in \mathbf{R}$

3) Consider the map
$$f(x) = x^2 - 2 \qquad x \in \mathbf{R}.$$

   a) Using the change of coordinate
$$\phi(u) = u + \frac{1}{u},$$
   express the semi-conjugate map $\widehat{f}(u)$ that satisfies the condition
$$f(\phi(u)) = \phi(\widehat{f}(u)).$$

   b) Work out a complete description of f's dynamics—attraction, basins?