Solution

NAME

This quiz is closed book, closed notes, calculators are allowed but no other devices. 10 pts. possible.
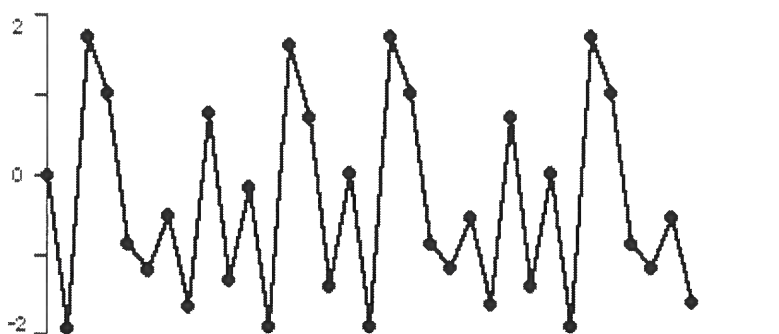
1. (2 pts.) Given the function $f(x) = 3x - 1$. Calculate the next four numbers in the orbit of 1. Show your work.

$$f(1) = 3 \cdot 1 - 1 = 2$$
$$f^{(2)}(1) = f(2) = 5$$
$$f^{(3)}(1) = f(5) = 14$$
$$f^{(4)}(1) = f(14) = 41$$

2. (3 pts.) Given the function $g(x) = 3x - 4$, use algebra to find a fixed point of $g(x)$. Show your work.

$$g(x^*) = x^*$$
$$3x^* - 4 = x^*$$
$$2x^* = 4$$
$$x^* = 2$$

3. (2 pts.) Here is a time series of iterates on the function $f(x)$. Using this graph, give the first 4 values of the orbit of the initial value $x_0 = 0$.

$-2, 1.8, 1, -.9$

4. (3 pts.) a. Draw, directly on the graph below, the first four graphical iterates (cobweb diagram) for the initial value $x_0 = .1$

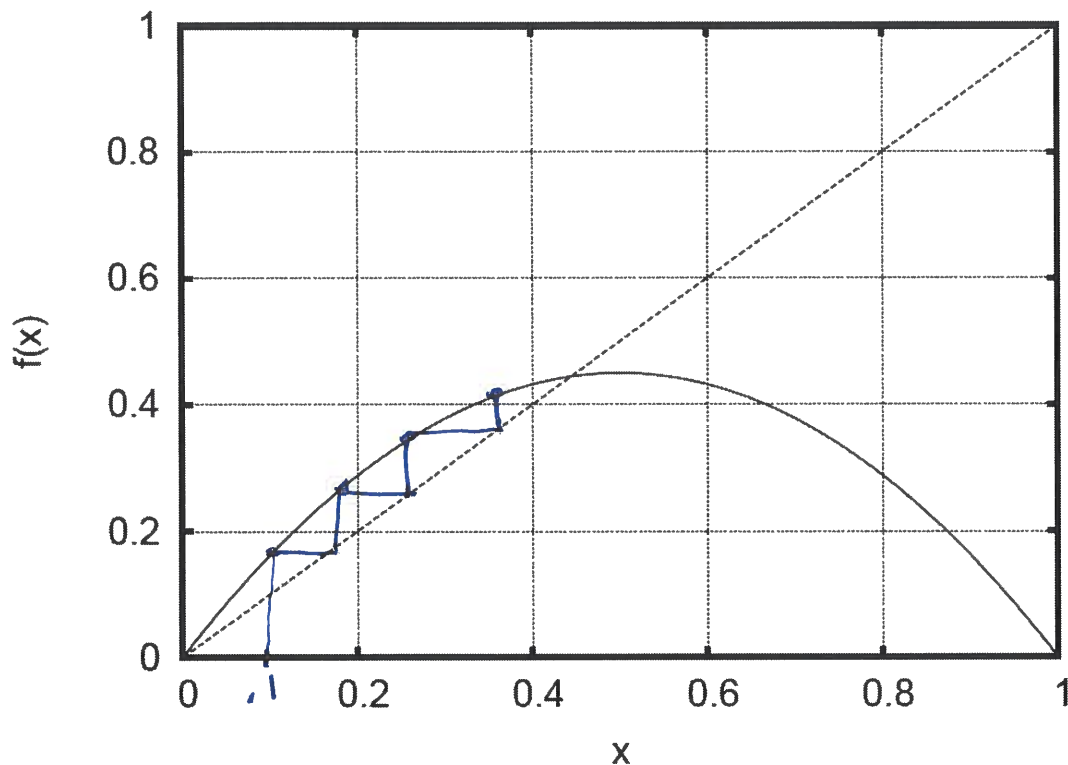b. What does this say about the stability of the equilibrium at roughly $x^* = .45$?

Fig. 4.1 The graph of a function $f(x)$. The dashed line is the $y = x$ line.

$x^* = .45$ is stable since
the orbits are getting closer.