**Question**

For each of the functions $f(x)$ given below, consider the sequence constructed by setting $x_{n+1} = f(x_n)$ for $n \geq 0$ and taking $x_0 = c$. Determine whether $\{x_n\}$ converges or diverges, and note that this may depend on the initial choice of $c$. Where possible, calculate the limit when it exists.

1. $f(x) = x + 3$;

2. $f(x) = \frac{1}{3}x + \frac{3}{4}$;

3. $f(x) = \frac{2}{5}x + \frac{1}{5}$;

4. $f(x) = 10 - x$;

5. $f(x) = \sqrt{3x}$;

6. $f(x) = \frac{1}{2}\left(x + \frac{c}{x}\right)$;

7. $f(x) = \frac{1}{2}(x + 4)$;

**Answer**