Answer on Question #61280 – Math – Calculus

Question

Describe the long term behaviour of the sequence x (to the base n) given by

$$x_n = 11 \cdot (0.9)^n - 5 \ (n = 1,2,3 \dots).$$

Justify your answer.

Solution

Because $(0.9)^n \to 0$ as $n \to \infty$, hence the sequence $x_n = 11 \cdot (0.9)^n - 5$ tends to -5:

$$\lim_{n\to\infty}(11 \cdot (0.9)^n - 5) = \lim_{n\to\infty}(11 \cdot (0.9)^n) - 5 =$$
$$= 11 \lim_{n\to\infty}(0.9)^n - 5 = 11 \cdot 0 - 5 = -5\,.$$

However, it will do so from above, with terms being greater than -5:

$x_n > -5$;

$11 \cdot (0.9)^n - 5 > -5$;

$11 \cdot (0.9)^n > 0, \ n = 1, 2, 3, \dots$