

Exercise 21

Guess the value of the limit (if it exists) by evaluating the function at the given numbers (correct to six decimal places).

$$\lim_{t \rightarrow 0} \frac{e^{5t} - 1}{t}, \quad t = \pm 0.5, \pm 0.1, \pm 0.01, \pm 0.001, \pm 0.0001$$

Solution

Evaluate the given function at all the given values of x .

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=-0.5} = 1.83583$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=-0.1} = 3.93469$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=-0.01} = 4.87706$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=-0.001} = 4.98752$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=-0.0001} = 4.99875$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=0.0001} = 5.00125$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=0.001} = 5.01252$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=0.01} = 5.12711$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=0.1} = 6.48721$$

$$\left. \frac{e^{5t} - 1}{t} \right|_{t=0.5} = 22.365$$

Therefore,

$$\lim_{t \rightarrow 0} \frac{e^{5t} - 1}{t} = 5.$$