

Exercise 26

Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically.

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

Solution

Evaluate the given function at several values of t .

$$\left. \frac{5^t - 1}{t} \right|_{t=-0.1} = 1.4866$$

$$\left. \frac{5^t - 1}{t} \right|_{t=-0.01} = 1.59656$$

$$\left. \frac{5^t - 1}{t} \right|_{t=-0.001} = 1.60814$$

$$\left. \frac{5^t - 1}{t} \right|_{t=-0.0001} = 1.60931$$

$$\left. \frac{5^t - 1}{t} \right|_{t=0.0001} = 1.60957$$

$$\left. \frac{5^t - 1}{t} \right|_{t=0.001} = 1.61073$$

$$\left. \frac{5^t - 1}{t} \right|_{t=0.01} = 1.62246$$

$$\left. \frac{5^t - 1}{t} \right|_{t=0.1} = 1.74619$$

Therefore,

$$\lim_{t \rightarrow 0} \frac{5^t - 1}{t} \approx 1.6094 \approx \ln 5.$$

Below is a plot of the given function versus t .

