

Exercise 71

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Chapter 4 | Section 4-5 | Page 262



Thomas' Calculus Early Transcendentals

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Table of contents

Explanation Verified

Step 1

1 of 7

$$\lim_{x \rightarrow \infty} \frac{2^x - 3^x}{3^x + 4^x}$$

Given.

Step 2

2 of 7

$$\lim_{x \rightarrow \infty} \frac{2^x - 3^x}{3^x + 4^x} \cdot \frac{\frac{1}{3^x}}{\frac{1}{3^x}}$$

$$\frac{\frac{1}{3^x}}{\frac{1}{3^x}} = 1$$

Step 3

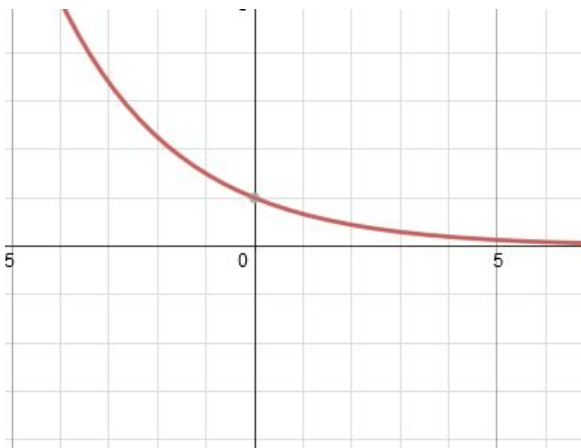
3 of 7

$$\lim_{x \rightarrow \infty} \frac{\left(\frac{2}{3}\right)^x - 1}{1 + \left(\frac{4}{3}\right)^x}$$

Distributive property.

Step 4

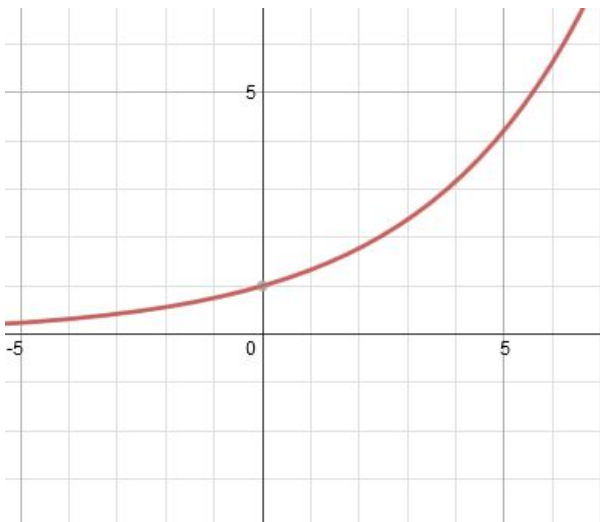
4 of 7



The graph $y = \left(\frac{2}{3}\right)^x$ illustrates that the value of the expression $\left(\frac{2}{3}\right)^x$ goes to 0 as x goes to infinity.

Step 5

5 of 7



The graph $y = \left(\frac{4}{3}\right)^x$ illustrates that the value of the expression $\left(\frac{4}{3}\right)^x$ goes to ∞ as x goes to ∞ .

Step 6

6 of 7

$$\begin{aligned} &= \lim_{x \rightarrow \infty} \frac{\left(\frac{2}{3}\right)^x - 1}{1 + \left(\frac{4}{3}\right)^x} \\ &= \frac{0 - 1}{1 + \infty} = \frac{1}{\infty} = 0 \end{aligned}$$

Substitute values of limits based on graphical interpretations.

Result

7 of 7

0