

Watch. Practice. Understand. | Lesson 266

Calculus 2 4 The Precise Definition of Limit with Epsilon and Delta

Watch the matching video: <https://www.youtube.com/watch?v=RQVIZlgDHhs>

Practice focus: Epsilon-delta limits

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

01 Prove $\lim_{x \rightarrow 2} (3x + 1) = 7$ by giving δ in terms of ϵ .

02 For the preceding linear function, find a δ that guarantees error below 0.01.

03 Give δ for $\lim_{x \rightarrow -1} (5x - 2) = -7$.

04 In the limit definition, may δ depend on x ? Explain.

Worked answers | Lesson 266

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01 Prove $\lim_{x \rightarrow 2} (3x + 1) = 7$ by giving δ in terms of ϵ .

$|(3x+1)-7| = 3|x-2|$. Choose $\delta = \epsilon/3$; then $0 < |x-2| < \delta$ implies the error is $< \epsilon$.

02 For the preceding linear function, find a δ that guarantees error below 0.01.

$\delta = 0.01/3 = 1/300$ works.

03 Give δ for $\lim_{x \rightarrow -1} (5x - 2) = -7$.

Error $|5x+5| = 5|x+1|$; choose $\delta = \epsilon/5$.

04 In the limit definition, may δ depend on x ? Explain.

No. For each $\epsilon > 0$, choose a single $\delta > 0$ that works for every x in the punctured δ -neighborhood.