

Could it be anything?

Break-Ground:

Could it be anything?

Two young mathematicians investigate the arithmetic of large and small numbers.

Check out this dialogue between two calculus students (based on a true story):

Devyn: Hey Riley, remember

$$\lim_{\theta \rightarrow 0} \frac{\sin(\theta)}{\theta}?$$

Riley: It is equal to 1!

Devyn: But was that crazy proof with all the triangles really necessary? I mean, just plug in zero.

$$\left[\frac{\sin(\theta)}{\theta} \right]_{\theta=0} = \frac{\sin(0)}{0} = \frac{0}{0} \dots$$

Riley: You were going to say “1,” right?

Devyn: Yeah, but now I’m not sure I was right.

Riley: Dividing by zero is usually a bad idea.

Devyn: You are right. I will never do it again! Also, don’t tell anyone about this conversation.

Riley: What conversation?

Devyn: Exactly.

Problem 1 Consider the function

$$f(x) = \frac{x}{x}.$$

$$f(0) = \boxed{DNE} \quad \lim_{x \rightarrow 0} f(x) = \boxed{1}.$$

Learning outcomes: Calculate limits of the form zero over zero.

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Problem 2 Consider the function

$$f(x) = \frac{4x}{x}.$$

$$f(0) = \boxed{DNE} \quad \lim_{x \rightarrow 0} f(x) = \boxed{4}.$$

Problem 3 Consider the function

$$f(x) = \frac{x}{-3x}.$$

$$f(0) = \boxed{DNE} \quad \lim_{x \rightarrow 0} f(x) = \boxed{-1/3}.$$
