The Other Improper Integral

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Announcements

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The other improper integral

Now let's examine a seemingly simple integral:

$$\int_{-1}^{1} \frac{1}{x^2}\, dx$$

The other improper integral

The other improper integral

Clearly the issue is that we're trying to integrate a function that has a _______________ at $x = 0$. This gives rise to the second type of improper integral.

The other improper integral

1. Suppose $f(x)$ is continuous on the interval $[a, b)$, then

$$\int_a^b f(x)\,dx =$$

2. Suppose $f(x)$ is continuous on the interval $(a, b]$, then

$$\int_a^b f(x)\,dx =$$

3. Suppose $f(x)$ is continuous on the interval $[a, b]$, except at the point $x = c$, then

$$\int_a^b f(x)\,dx =$$

The other improper integral

Just like before, if the limits in the previous slide exist, we say the improper integral ______________ with the same value as the limit. If the limit fails to exists, we say the improper integral ______________.

Example

Does the improper integral

$$\int_0^1 \frac{1}{\sqrt{x}}\,dx$$

converge or diverge?

Example

Example

Let's take a look at the example

$$\int_{-1}^{1} \frac{1}{x^2}\, dx$$

one more time.

Example

Example

What is the value of a that gives

$$\int_0^1 \frac{1}{x^a}\, dx = 2.5?$$

Example