

Math 2143 - Brief Calculus with Applications

Written Assignment 7 - Due 2018.07.22

Directions: Please answer the following question in complete sentences. Be sure to label all geometric objects in any illustrations (if any). I will accept an answer in a scanned image format, as a pdf, or as a picture taken and sent from your awesome smart phone.

Question: So remember that an improper integral has at least one infinite limit. Consider the following integral:

$$\int_{-\infty}^{\infty} x^3 dx$$

First, if we interpret this integral as the following limit:

$$\int_{-\infty}^{\infty} x^3 dx = \lim_{a \rightarrow \infty} \int_{-a}^a x^3 dx,$$

what value do you arrive at? From a geometric point of view, does this make sense?

For the next interpretation, consider

$$\int_{-\infty}^{\infty} x^3 dx = \lim_{a \rightarrow -\infty} \int_{-a}^0 x^3 dx + \lim_{b \rightarrow \infty} \int_0^b x^3 dx.$$

What result do you get this time? Be very very careful!

Thirdly, evaluate

$$\int_{-\infty}^{\infty} x^3 dx = \lim_{a \rightarrow \infty} \int_{-a}^{2a} x^3 dx.$$

What can you conclude about the integral first given as a result of your work here?