Arc Length and Surface Area Assignment

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Arc Length and Surface Area Assignment

Question 0

Watch the lecture video here.

Did you watch the video? [Type yes or no.]

Question 1

Approximate the length of $f(x) = x^4$ from $x = 0$ to $x = 1$ using the following steps:

- Divide the interval $[0, 1]$ into 5 equal subdivisions of width $\Delta x = \frac{1}{5}$.
- Calculate the length of the line segment from $(x_i, f(x_i))$ to $(x_{i+1}, f(x_{i+1}))$ using the distance formula for $i = 0,\ 1,\ 2,\ 3,\ 4$.
- Add up the five lengths from the last step. This is your approximation. Convert your approximation to a decimal using N(_).
- Now use numerical_integral to calculate the actual arc length.
- Calculate the difference between your approximation and the actual value (this is your error). [Answer: error ≈ 0.0059]

Question 2

Find the length of $f(x) = \sqrt{1 - x^2}$ from $x = -1$ to $x = 1$. [Answer: π]

Question 3

Find the area of the surface formed by rotating around the x-axis the graph of $f(x) = \sin(x)$ from $x = 0$ to $x = \pi$. [Answer: ≈ 14.42]

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Question 4

Find the area of the surface formed by rotating around the y-axis the graph of $g(y) = y^3$ from $y = 1$ to $y = 2$. [Answer: ≈ 199.48]