

Calculus: Homework 12

December 13th, 2007

1. Consider the region below the function $f(x) = 1/(1 + x^2)$ and above the x -axis with $0 \leq x \leq 1$. Find the volume of the solid obtained by rotating the region about the x -axis.

2. Evaluate

$$\int \frac{dx}{x^4 + 4}.$$

3. Find a quadratic polynomial $f(x)$ such that $f(0) = 1$, $f'(0) = 0$, and

$$\int \frac{f(x)}{x^3(x-1)^2} dx$$

is a rational function.

4. Determine whether the integral

$$\int_{-\infty}^{\infty} \frac{|\sin x| + |\cos x|}{|x| + 1} dx$$

is convergent or not.

5. Find all $a \in \mathbb{R}$ such that the following integral is convergent

$$\int_0^{\infty} \frac{dx}{a^2\sqrt{x} + \sqrt{x^3}}.$$

For those a , also evaluate the integral.