Past Final Exam Problems Related to Stewart 5.2, 5.3

The following problems appear on sample final exams for MATH 1271 available at https://www.lib.umn.edu/course/MATH/1271. This list is not exhaustive.

Properties of the Integral

3. Use the properties of the integral \( I = \int_{1}^{2} \sqrt{x^4 + 9 \sin^2 x} \, dx \) to find the best upper and lower bounds on \( I \):

Fundamental Theorem of Calculus, Part I

Let \( f(x) = \int_{2}^{x} \sqrt{7t^2 + 8} \, dt \). Then \( f'(2) = \)

Let \( f(x) = \int_{2}^{x^2} t^4 \, dt \). Then \( f'(2) = \)

Let \( f(x) = \int_{x}^{7} (3t^2 - \sin t)^5 \, dt \). Then \( f'(-2) = \)

If \( f(x) = \int_{2}^{x+1} t\sqrt{7 + t^2} \, dt \) then what is \( f'(2) \)?

Fundamental Theorem of Calculus, Part II

\[ \int_{1}^{3} x^{3/4} (x + x^2) \, dx \]

equals

Write as an integral and evaluate: \( \lim_{n \to \infty} \frac{1}{n} \sum_{i=1}^{n} (\frac{i}{n})^7 \).

17. Find the total area of the bounded regions between the \( x \)-axis and the graph of \( y = x(x - 1)(x - 2) \).

1. Which of the following is NOT equal to \( \int_{0}^{2} \sqrt{4 - x^2} \, dx \)?

A. \( \lim_{n \to \infty} \sum_{i=1}^{n} \frac{2}{n} \sqrt{4 - (2i/n)^2} \)

B. \( \pi \)

C. \( F(2) - F(0) \) where \( F'(x) = \sqrt{4 - x^2} \)

D. The area of a half circle of radius 2

E. \( \lim_{n \to \infty} \sum_{i=0}^{n-1} \frac{2}{n} \sqrt{4 - (2i)^2/n^2} \)