Exam 3 Review

Topics

4.2 Absolute Max/Min

4.3 Shape of Curve: 4 step process

4.6 Optimization Problems

4.8 Antiderivatives

5.1 Riemann Sums

5.2 Integral as Area

5.3 Evaluation Theorem

5.4 Fundamental Theorem of Calculus

5.5 Substitution Rule

Absolute max/min

Find the absolute max/min values on the interval [0,4] for

$$f(x) = 5 + 54x - 2x^3$$

Shape of graph

For the function $f(x)$, find

- The intervals where it's increasing/decreasing
- The local maxes/mins
- The intervals where it's concave up/concave down
- The inflection points

$$f(x) = 5 + 54x - 2x^3$$

Optimization

When solving an optimization problem:

- Draw a picture of the scenario.
- Identify what quantity you are optimizing. Write down that equation.
- Write down a second equation from information given (the constraining equation.
- Solve the second equation for a variable. Substitute it into the first equation.
- The first equation should now have only one variable. Minimize/maximize it.
- Make sure to answer the question!

Optimization

We build a can in the shape of a cylinder closed on both ends. We have enough metal for 100 squared centimeters of surface area. What dimensions maximize the volume of the can? What is the maximum volume?

Antiderivatives

Find the original function $f(x)$ if $f(0) = 9$ and $f(2) = 15$ and

$$f''(x) = 2 - 12x$$

Riemann sum

Find the left Riemann sum for $n = 3$ for the integral

$$\int_5^8 \frac{\sqrt{x}}{x+1}\, dx$$

Integral as area

Interpret the integral in terms of the area of shapes to calculate the definite integral

$$\int_{-2}^{2} 3 + \sqrt{4 - x^2}\, dx$$

Evaluation theorem

Evaluate the definite integral.

$$\int_{\pi}^{2\pi} \sin(x) + 5 \, dx$$

Fundamental theorem of calculus

For the function

$$g(x) = \int_0^{2x} \frac{\sec(2t) - t}{t^2}\, dt,$$

find $g'(x)$.

Substitution

Calculate the integral

$$\int_2^3 \frac{\sin(\ln(x))}{x}\, dx$$