PROGRAMMING ASSIGNMENT 4A

To find the area of the figure bounded by the parabola y = x^2 and the x-axis on the interval x = [0, 10], we can use numerical integration, specifically the trapezoidal rule. The trapezoidal rule is a simple numerical integration method that approximates the area under a curve by approximating it with a series of trapezoids.

The formula for the trapezoidal rule is:

A ≈ ∑[(f(xi) + f(xi+1))/2] \* (xi+1 - xi)

where A is the approximated area, f is the function we want to integrate (in this case y = x^2), xi and xi+1 are the endpoints of each trapezoid, and the sum is taken over all the trapezoids used to approximate the area.

Using this formula, we can write the following C++ program to find the area of the figure:

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The program defines the function f(x) = x^2 and then sets the interval a = 0 and b = 10. It also sets the number of trapezoids to use (n = 1000) and computes the width of each trapezoid (h = (b - a) / n).

Then, the program loops over all the trapezoids, computing the value of the function at the midpoint of each trapezoid (x = a + i \* h) and adding it to a running sum. Finally, it computes the approximated area using the trapezoidal rule formula and prints the result. The output will be the area of the figure bounded by the parabola y = x^2 and the x-axis on the interval x = [0, 10].

Part B

To find the area of the figure bounded by the graphs of the two functions, we need to find the points where they intersect. Setting the two functions equal to each other, we have:

x^2 = 4cos x

We can solve for x numerically using a graphing calculator or a numerical method such as Newton's method. One solution is approximately x ≈ -1.47, and the other is approximately x ≈ 1.47.

Thus, the bounded region is symmetric about the y-axis, so we can focus on the area in the positive x-axis. We integrate with respect to x from 0 to 1.47:

∫[0, 1.47] (4cos x - x^2) dx

We can evaluate this integral using the power rule and the trigonometric identity sin(x) = -cos'(x):

= [4sin x - (1/3)x^3] from 0 to 1.47

= [4sin(1.47) - (1/3)(1.47)^3] - [4sin(0) - (1/3)(0)^3]

= [4sin(1.47) - (1/3)(1.47)^3]

≈ 3.99

Therefore, the area of the bounded figure is approximately 3.99 square units.

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