Problem 1. The picture below shows the graph of a function $g$.

(a) [10 points] Find $\int_{-1}^{5} g'(t) \, dt$.

(b) [10 points] Let $A(x) = \int_{1}^{x} g(t) \, dt$. Find $A'(2)$. 
Problem 2. [20 points] Determine whether \( \int_{1}^{\infty} \frac{\sin^2(x)}{x^3} \, dx \) converges or diverges. Justify your answer completely.
Problem 3. Below is a sketch of $y = f(x)$. The polygonal paths may make it easier to approximate $\int_1^3 f(x) dx$.

(a) [10 points] Use the trapezoid rule with $n = 4$ to approximate $\int_1^3 f(x) dx$.

(b) [10 points] Use the midpoint rule with $n = 4$ to approximate $\int_1^3 f(x) dx$. 


Problem 4. [20 points] Consider the region trapped by the two curves

\[ y = \frac{2}{1 + x^2} \quad \text{and} \quad y = 2 - \sqrt{x} \]

between the points \((0, 2)\) and \((1, 1)\). Here is a sketch showing the region:

Use an integral to express the volume of the solid formed by rotating this region around the \(y\)-axis. Do not evaluate the integral.
Problem 5. [5 points each] Matching. Put the letter that matches the answer on the line. You need not show your work.

• \[
\int_{-1}^{3} \frac{dx}{x^2}
\]

• \[
\int_{0}^{1} x \sqrt{1 - x^2} dx
\]

• \[
\int_{-\frac{1}{2}}^{0} 3y e^{-2y} dy
\]

• \[
\int_{-1}^{1} \sqrt{1 - t^2} dt
\]

(a) \(\frac{3}{4}\)  
(b) \(\frac{\pi}{2}\)  
(c) \(\infty\)  
(d) \(\frac{1}{3}\)
EXAM

Midterm 1
Math 132
Tuesday February 24, 2004

• Name .................................................................

• Student ID ............................................................

• Lecture Section .....................................................

• Recitation Section ..................................................

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