Math 155
Exam 4
April 15, 2003

NAME: ___________________________ Section #____ SSN: X X X X X __ __ __ __

Math 155 Exam Grade

<table>
<thead>
<tr>
<th>Question</th>
<th>Grade</th>
<th>(out of)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 5</td>
<td>___________</td>
<td>(out of 20)</td>
</tr>
<tr>
<td>6</td>
<td>___________</td>
<td>(out of 8)</td>
</tr>
<tr>
<td>7</td>
<td>___________</td>
<td>(out of 8)</td>
</tr>
<tr>
<td>8(a,b)</td>
<td>___________</td>
<td>(out of 16)</td>
</tr>
<tr>
<td>8(c,d)</td>
<td>___________</td>
<td>(out of 16)</td>
</tr>
<tr>
<td>8(e,f)</td>
<td>___________</td>
<td>(out of 12)</td>
</tr>
<tr>
<td>9</td>
<td>___________</td>
<td>(out of 10)</td>
</tr>
<tr>
<td>10</td>
<td>___________</td>
<td>(out of 10)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>___________</td>
<td>(out of 100)</td>
</tr>
</tbody>
</table>
PART 1. This portion of the exam is to test basic knowledge and calculation skills to a correct solution. Accurate calculation is expected as there will be no partial credit to each of the problems in this part. (Value: 4 points each).

1. The value of \( \int_{0}^{1} (4x^3 - 2x)dx \) equals

2. The sum of \( \sum_{i=1}^{3} i^2 \) equals

3. Compare the value of the integral \( \int_{0}^{1} (1-x)dx \) and the Riemann sum \( R_3 \) for \( f(x) = 1-x \) on \([0, 1]\) and a regular partition with \( n = 3 \), using \( x_i^* = x_i \), the right-hand end point of the \( i \)th interval \([x_{i-1}, x_i]\). The bigger quantity of \( R_3 \) and \( \int_{0}^{1} (1-x)dx \) is

4. The average of the \( f(x) = (x + 1)^2 \) on \([-1, 2]\) equals

5. The value of \( \int_{-1}^{1} \sqrt{1-x^2}dx \) equals
PART 2: This portion of the exam will be graded on a partial credit basis. Answers without supporting work shown on the paper will receive NO credit.

6. (4 points each)
   (a) For a function \( F(x) = \int_1^x t \sqrt{1 + t^4} \, dt \), compute \( F'(x) \).

   (b) For a function \( F(x) = \int_1^{x^2+1} t \sin(t^2) \, dt \), compute \( F'(x) \).

7. (8 points) Find the function \( y(x) \) satisfying

\[
\frac{dy}{dx} = 4x^3 + 2x + 1 \text{ and } y(2) = 25.
\]
8. Compute the following integrals or antiderivatives.

(a) \(8 \text{ points}\) \(\int_1^2 \frac{x^3 - 1}{x^2} \, dx\).

(b) \(8 \text{ points}\) \(\int_0^3 x \sqrt{25 - x^2} \, dx\).

(c) \(8 \text{ points}\) \(\int \sin(2x) \cos^2(2x) \, dx\).
(d) (8 points) \( \int_0^4 (1 + \sqrt{x})^2 dx \).

(e) (8 points) \( \int x^2 \sin(2 + x^3) dx \).

(f) (4 points) \( \int_0^4 |x - 3| dx \).
9. (10 points) Find the area of the region $R$ bounded above by the graph of $y = x$ and below by the graph of $y = x^3$ over the interval $[0, 1]$.

10. (10 points) Find the area of the region $R$ bounded by the curves $y = 4x^2$ and $y = x^2 + 3$. 