Math 162: Calculus IIA

First Midterm Exam

October 18, 2011

NAME (please print legibly): ____________________________________________
Your University ID Number: ____________________________________________
Indicate your instructor with a check in the box:

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Time</th>
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<tbody>
<tr>
<td>Yoonbok Lee</td>
<td>MWF 9:00 - 9:50 AM</td>
</tr>
<tr>
<td>Doug Ravenel</td>
<td>MWF 10:00 - 10:50 AM</td>
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<tr>
<td>Don Larson</td>
<td>MW 11:00 - 11:50 AM</td>
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</tbody>
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- The presence of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden.

- Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.

- Put your answers in the space provided at the bottom of each page or half page.

- You are responsible for checking that this exam has all 11 pages.

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<th>QUESTION</th>
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1. **(20 points)** Evaluate the following integrals:

(a) (10 points)

\[ \int \frac{3x}{(x + 1)(x^3 + 1)} \, dx. \]
(b) (10 points)

\[ \int_0^{\pi/2} \sin^4 x dx. \]

ANSWER:
2. (20 points)

(a) (10 points) Use integration by parts to find a formula for

\[ \int (\ln x)^n \, dx \quad \text{in terms of} \quad \int (\ln x)^{n-1} \, dx \]
(b) (10 points) Use this formula to find

\[ \int (\ln x)^2 \, dx. \]
3. (20 points) (a) (10 points) Find the integral
\[
\int_{-1}^{0} \frac{dx}{\sqrt{x^2 + 4x + 3}}
\]
(b) (10 points) Find the integral

\[ \int_4^6 \sqrt{8x - x^2} \, dx. \]
4. (20 points) Consider the curve

\[ f(x) = 2x^{3/2} + 7 \]

(a) (10 points) Calculate the arc length function \( s(t) \) starting at \( x = 0 \), that computes the length of the curve from \((0, f(0))\) to \((t, f(t))\).
(b) (10 points) Calculate the arc length from $x = 2$ to $x = 4$.  

\begin{center}
\textbf{ANSWER:}
\end{center}
5. (20 points) Consider region between the curves $y = 2x$ and $y = x^2$.

(a) Find the volume of the solid of revolution about the $x$-axis.

ANSWER:
(b) Find the volume of the solid of revolution about the $y$-axis.

ANSWER: