Math 109, Fall 2018
Midterm 1

Name:
Section:

Requirements:
■ This exam should be completed in 45 minutes.
■ Books, notes, calculators, computers, discussion and collaboration are not allowed.
■ Do all of your work in this exam booklet.
■ Simplify all answers as far as possible.
■ Solutions without proper justification will receive no credit.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Points</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Problem 1. (30’) Compute the following integrals

(a). $\int \tan^5 x \sec^3 x \, dx$. 
(b). \[ \int \sin^2 x \cos^2 x \, dx. \]
Problem 2. (15’) Find the general solution to the differential equation

\[ y'(x) = (y - 1) \cos x. \]
Problem 3. (15’) Solve the differential equation

\[ y'(x) + y = \sin x, \ y(0) = 1. \]  \hspace{1cm} (2)
Problem 4. (20’) Compute the following integral

\[ \int \frac{e^{3x}}{e^{2x} - 2e^x + 1} \, dx. \]
Problem 5 (20’)

(a). (8’) Draw the parametric curve $x = \cos t, y = \sin t$, for $t \in [0, 2\pi]$. 
(b). (12') Find the point/points on this curve, at which the tangent line is parallel to the line $y = x + 1$. 