Name:

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.

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<th>Problem</th>
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Problem 1. (15’)
Compute the following integral
\[
\int \tan^2 x \sec^4 x \, dx. \tag{1}
\]
Problem 2. (15’)
Solve the differential equation

\[ y'(x) = y^2 \cos x. \]  \hspace{1cm} (2)
Problem 3. (20’)
Find an equation of the tangent line to the parametric curve

\[ x = t \cos t, \quad y = t \sin t, \quad (3) \]

at the point \( t = \pi/2 \).
Problem 4. (25’)
Compute the following integral
\[ \int \frac{e^{2x}}{e^{2x} - e^x - 2} \, dx. \]
Problem 5 (25’)

Kirchhoff’s law of circuits says $L \frac{dI(t)}{dt} + RI(t) = E(t)$. Suppose in a circuit the battery produces a variable voltage of $E(t) = t$, the resistance is $R = 12$ and the inductance is $L = 4$. Suppose the initial current is $I(0) = 0$. Find the current $I(t)$ as a function of $t$. 