Sample Questions for Final Exam

The following list of questions is designed to give you an idea of the difficulty level of questions that I will ask on the final exam. This list is not comprehensive – there are questions I could ask that are not on here. You are responsible for all the material we have covered in this course, in class, in written homework and in online quizzes. But this should serve as a guide to the level of mastery I will be looking for.

The final exam is comprehensive, but this handout covers only the most recent material. Therefore, you should also review the sample questions for the midterm exams. If you need to obtain those, they are available on the class website.

You will be allowed to use a single sheet (8”x11”) of notes (both sides) and a graphing calculator during the exam. No other references will be allowed.

I will not answer further questions about what will or will not be on the exam.

1. Solve the initial-value problem:

\[
\begin{cases}
\dot{x} = x + y \\
\dot{y} = 3x - y \\
x(0) = 3 \\
y(0) = -5
\end{cases}
\]

2. Solve the initial-value problem:

\[
\begin{cases}
\dot{x} = 2y \\
\dot{y} = -2x \\
x(0) = 1 \\
y(0) = 1
\end{cases}
\]

3. Solve the initial-value problem:

\[
\begin{cases}
\dot{x} = 7x - y \\
\dot{y} = 4x + 3y \\
x(0) = 2 \\
y(0) = 0
\end{cases}
\]

More on back...
4. Solve the initial-value problem:

\[ \begin{align*}
y'' + y &= \delta(x - \pi) \\
y(0) &= 1 \\
y'(0) &= 0
\end{align*} \]

Write your answer as a piecewise-defined function.

5. Solve the initial value problem \( \ddot{x} + 3\dot{x} + 2x = 0, \quad x(0) = 1, \quad \dot{x}(0) = 0 \) by writing it as a system of first-order equations.

*Also review the sample questions that were provided for the first two midterm exams.*

The same list of Laplace Transforms that was provided on the second midterm exam will be provided on the final exam. Unless a question asks you to use the definition of the Laplace Transform, you may use any of the formulas from this table without first proving them.