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. This list of sample questions is several questions longer than the actual test will be.

The Final exam will cover the material from Exams 1 and 2, plus the material in Sections 7.1, 7.2, 7.5, and 8.2.

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:
\[
\begin{align*}
\dot{x} &= x + y \\
\dot{y} &= 3x - y \\
x(0) &= 3 \\
y(0) &= -5
\end{align*}
\]

2. Sketch a phase portrait for the system \(\dot{x} = -8x - 9y, \quad \dot{y} = -14x + 3y\).

3. Solve the initial-value problem using Laplace Transforms (you may use a table of transforms):
\[
\begin{align*}
y' + y &= 1 \\
y(0) &= 0
\end{align*}
\]

4. Use the definition of the Laplace Transform to verify that \(\mathcal{L}\{t^2\} = \frac{2}{s^3}\).

5. Solve the initial-value problem:
\[
\begin{align*}
y'' + y &= \delta(x) \\
y(0) &= 1 \\
y'(0) &= 0
\end{align*}
\]

In addition to these problems, review the sample questions for Exam 1 and Exam 2.