Name:_____

Student ID:_____

Section:_____

Instructor: Dr. Dang

Math 2320 (Differential Equations)
Practice Exam 3

Instructions:

- Work on scratch paper will not be graded.
- Show all your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer.
- **Please write neatly. If I cannot read your handwriting, you will not receive credit.**
- Simplify your answers as much as possible. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, etc. must be simplified for full credit.

Show all work in the space provided. Full credit will be given only if all steps are shown justifying your answer. Please write neatly and carefully, if I cannot read your handwriting, you will receive NO credit.

1. (10 points) Find the Laplace transform:

   (a) $\mathscr{L}\{\cos(2x)\mathcal{U}(x-\pi)\}$

   (b) $\mathscr{L}\{xe^{2x}\sin(6x)\}$

2. (10 points) Find the inverse Laplace transform:

(a) $\mathscr{L}^{-1}\left\{\dfrac{2s+5}{s^2+6s+34}\right\}$

(b) $\mathscr{L}^{-1}\left\{\dfrac{e^{-s}}{s(s+1)}\right\}$

3. (10 points) Solve the IVP:

$$y'' + 3y' + 2y = g(x), y(0) = 2, y'(0) = -1,$$

where $g(x) = \begin{cases} e^{-x} & 0 \leq x < 3 \\ 1 & x \geq 3 \end{cases}$.

4. (10 points) Solve the homogeneous linear system using the eigenvalues method:

$$x' = -x + 2y$$
$$y' = -x - 3y$$

5. (10 points) Solve the nonhomogeneous linear system using the elimination method:

$$x' + 3x + y' + y = e^t$$
$$x' + x + y' - y = t$$

6. (10 points) Solve the IVP using the Laplace transform method:

$$\begin{aligned} x' + y &= x \\ 2x' + y'' &= \mathcal{U}(t-3), x(0) = 0, y(0) = 1, y'(0) = -1 \end{aligned}$$

END OF EXAM