Math 252 X01
Assignment 3

Covers: Sections 4.6, 4.7, 5.1
Due: Thurs March 12 at 8:30am

INSTRUCTIONS:
This assignment will be marked for completion.
Solutions will be posted on the course website 24 hours after the deadline.
You may not copy the work of another person or AI.
Submit jpg or pdf files to the D2L Dropbox.

1. The DE $y'' - 7y' + 12y = 8x^3$ has $y_C = C_1 e^{3x} + C_2 e^{4x}$. Solve the DE using Variation of Parameters.

2. Solve:

a) $x^2y'' + 4xy' + 13y = 0$
b) $x^2y'' + 9xy' + 16y = 0$
c) $x^2y'' - 3xy' + 2y = 0$

3. A mass of 3 kg is attached to a spring with spring constant 27 N/m and there is no damping. The mass is released from 20 cm below equilibrium with an upward velocity of 0.9 m/s.
a) Find the position $x(t)$ of the mass as a function of time.
b) Express $x(t)$ as $A\sin(\omega t + \phi)$.
c) Find the first time when the mass reaches its lowest point. Round your answer to two decimal places.

4. A mass of 8 kg is attached to a spring whose spring constant is 3 N/m. There is a damping force of magnitude four times the velocity.
a) Set up the DE but do not solve it.
b) Is the motion overdamped, underdamped or critically-damped? Justify your answer.