MATH 308 – MOCK MIDTERM 2

Note: Please also look at the midterm review problems for a more comprehensive study experience

1. Solve using undetermined coefficients

$$\begin{cases} y'' - 4y' + 4y = 12te^{2t} \\ y(0) = 0 \\ y'(0) = 2 \end{cases}$$

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2. Use variation of parameters to find a particular solution to

$$y'' + 4y = 20\cos(3t)$$

Note: Simplify your answer as much as possible. You will need to use the formulas[1]

$$\begin{aligned}
\sin(A)\cos(B) &= \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right] \\
\cos(A)\cos(B) &= \frac{1}{2}\left[\cos(A+B) + \cos(A-B)\right] \\
\sin(A)\sin(B) &= \frac{1}{2}\left[-\cos(A+B) + \cos(A-B)\right]
\end{aligned}$$

[1] Please don't memorize them

3.

$$\begin{cases} y'' + 3y' + 2y = f(t) \\ y(0) = 0 \\ y'(0) = 0 \end{cases}$$

$$f(t) = \begin{cases} 2 & \text{if } 0 \leq t < 10 \\ 0 & \text{if } t \geq 10 \end{cases}$$

4. Solve the following integral equation

$$\phi(t) + \int_0^t (t - \xi)\phi(\xi)d\xi = 1$$

5. Find a recurrence relation for the coeffs in the series solution of

$$xy'' - y' + 4xy = 0$$

Simplify as much as possible