Discussion #31 4/20/26 – Spring 2026 MATH 54
Linear Algebra and Differential Equations

Problems

1. Answer the following *true* or *false*:
   (a) The functions $y_1(t) = e^{\alpha t}\cos(\beta t)$ and $y_2(t) = e^{\alpha t}\sin(\beta t)$ are linearly independent.
   (b) The polynomial $r^4 - 2$ has precisely two distinct roots.
   (c) The functions
   $$y_1 = t\sin(t) \quad \text{and} \quad y_2 = \cos(t)$$
   are linearly independent.

2. Find a particular solution of:
   (a) $y'' + 4y = 3x^3$
   (b) $y'' + 4y = \cos(x)$
   (c) $y'' + 4y = \cos(2x)$

3. Find the general form of a particular solution, but do **not** determine the values of the coefficients, of:
   (a) $y'' + 2y' + y = e^{-t} + \cos(t)$.
   (b) $y^{(4)} + 5y'' + 4y = \sin(x) + \cos(2x)$
   (c) $y^{(4)} - 2y'' + y = x^2\cos(x)$

4. Solve the initial value problem
   $$y'' + 4y = 2x, \quad y(0) = 1, \quad \text{and} \quad y'(0) = 2.$$