

1. Find solutions to the following equation

$$(D^4 + 2D^2 + 1)x = 0$$

Hint: Given the polynomial $r^4 + 2r^2 + 1$, let $u = r^2$ and factor in terms of u . What's the factorization in terms of r ?

2. Find the smallest order polynomial differential operator $A(D)$ such that $A(D)[y] = 0$ for the following functions. ($A(D)$ is known as an annihilator)

(a) $y = 2e^{2t} - \sin(t)$

(b) $y = t^2 \cos(t) + 3e^t$.

3. Find the general solution to

$$(D^3 - 3D^2 + 2D)x = 10 - 4e^{4t}$$

4. Make a simplified guess (don't solve for coefficients!) for

$$(D - 2)^3(D^2 + 1)(D + 3) = t^2 e^t - e^{-t} \sin(2t) - e^t$$

5. Solve the initial value problem for

$$(D^2 - 4)x = 6 + 5e^{-t}, \quad x(0) = x'(0) = 1$$