

MAP 2302—Elementary Differential Equations
Some extra exercises on the Method of Undetermined Coefficients

1. In each case, find the MUC *form* of a particular solution of the given differential equation. DO NOT try to find the numerical value of any undetermined coefficients you use. For each exercise, the answer should be expressed in terms of the independent variable given in that exercise, and should not include any unnecessary terms or coefficients.

(a) $y'' - 7y' + 12y = e^{-3t} + (20t^2 + 30)e^{4t} + 400e^{3t} \sin 4t + 5,000te^{3t} \cos 4t.$

(b) $y'' - 6y' + 13y = t^2e^{2t} + 32,611e^{3t} \cos 2t + \frac{1}{\pi}te^{3t}.$

(c) $y'' - y' - 2y = t \sin t + 10^{23}t^2e^{2t} + 48,000e^{2016t}.$

(d) $y'' - 6y' + 9y = 16e^{3x} + 3e^{3x} \cos(2x) + x^2e^x.$

(e) $y'' - 8y' + 16y = 2e^{4x} \cos x - 5e^x \sin 4x + (2x + 9)e^{4x} + 3 - 17e^{4x} \sin x.$

(f) $y'' - 4y' + 13y = \pi \cos 3t + \sqrt{23} te^{2t} \sin 3t + e^{2t} \cos 3t + 13t^2 - 52e^{2t}.$

2. In each case below, if the Method of Undetermined Coefficients (MUC) can be applied to find a particular solution. (Note: you are NOT being asked to find a particular solution, or even the MUC *form* of a particular solution, in the cases for which the MUC applies; you are simply being asked to figure out *whether* the MUC applies.) In all cases, t is the independent variable.

(a) $5y'' - 3y' + 2y = 2t^3 \cos 4t$

(b) $y'' - 3y' + 2y = 7t^{-1}e^{3t}$

(c) $y'' + 4y' + 4y = \frac{8}{\cos 2t}$

(d) $y'' + 2y' + 2y = e^{t-10\sqrt{2}} + 11t^2 + 12t + 13e^\pi + 14\pi^e$

(e) $y'' - 5ty' + 6y = 9e^{4t}$