Assignment #1 **_Math 290_** **_Name:_**

1. Determine the order, linear, non-linear, homogenous or non-homogeneous DE.

   1. $$\frac{d^3y}{dx^3} - 3x^3\frac{dy}{dx} + 7\sin(x)\,y = 0$$

   2. $$y'' - 5\tan(x)\,y' + 7y = e^{2x} + \sin x$$

   3. $$y\frac{d^3y}{dx^3} - 5x\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = \tan(3x)$$

   4. $$\sin(5x)\frac{d^2y}{dx^2} - e^{3x+1}\frac{dy}{dx} - (x^2+1)\,y = 0$$

2. Check if a function $y = f(x)$ or an expression is a solution of a DE. (where $c_1, c_2, \ldots, c_n$ are constants)

   a) $y = c_1 e^{\frac{2}{3}x} + c_2 e^{-3x}$ *for* $3y'' + 7y' - 6y = 0$

b) $y=e^{-2x}\left(c_1\cos\left(3x\right)+c_2\sin\left(2x\right)\right)$ *for* $y''+4y'+13y=0$

c) $y=c_1+c_2e^{-\frac{4}{3}x}+c_3e^{5x}$ *for* $y'''-11y''-20y'=0$

d) $y = c_1 x^2 + c_2 x^3 - x^2 \sin x \quad for \quad x^2 y'' - 4xy' + 6y = x^4 \sin x$

e) $e^{y/x} + xy^2 - x = c \quad for \quad \dfrac{dy}{dx} = \dfrac{x^2\left(1 - y^2\right) + ye^{y/x}}{x\left(e^{y/x} + 2x^2 y\right)}$

2. Determine λ so that y(x) is a solution of the given DE.

a) $y = e^{\lambda x}$ *for* $6y''+11y'-35y=0$

b) $y' = e^{\lambda x}$ *for* $9y''+12y'+13y=0$

c) $y = e^{\lambda x}$ *for* $25y'''-40y''+19y'=0$

d) $y = x^{\lambda}$ *for* $x^2 y'' + xy' - y = 0$

e) $y = x^{\lambda}$ *for* $x^2 y'' + 5xy' + 4y = 0$

f) $y = x^{\lambda}$ *for* $x^2 y'' - 7xy' + 15y = 0$