Differential Equations Test 4 Take home

Please write up the answers to these exercises and bring them to class on Tuesday.

1. (3 points+1 extra) Identify which of the following differential equations are ordinary at x=0, which are regular singular, and which are irregular singular. For the extra point identify which one is an Euler equation.
	1. $\left(x-1\right)^{2}y^{''}-x\left(x-1\right)y^{'}-2x^{2}y=0$
	2. $x\left(x-1\right)y^{''}-x^{2}y^{'}-2\left(x-1\right)^{2}y=0$
	3. $2x^{2}y^{''}-x\left(x-1\right)y^{'}-\left(x-1\right)^{2}=0$
	4. $x^{2}y^{''}-x\left(x-1\right)y^{'}-2\left(x-1\right)^{2}y=0$
2. (2 points +1 extra) Find the Taylor series expansion for sine.  For the extra point use this Taylor series to construct the MacLaurin series for cosine at $x=-π/2$.
3. (2 points) Find the recurrence relation on the Taylor series coefficients which determine the solution to y'' + y =0.
4. (3 points) Find the first four coefficients of the power series solution to xy''+y'+xy=0 at x=1 where y(1)=0 and y'(1) =1
5. (2 points) determine the values of **Φ** (4)(0), **Φ;**''(0), **Φ**''(0) for the solution y=**Φ** (x) of the initial value problem: y'' +x2y'+sin(x)y with y(0)=1 and y'(0)=0.
6. (2 points) Find the general solution to the differential equation: x2y'' +3xy'+5y=0
7. (2 points) Find the general power series solution for the following differential equation: x2y''-2y=0