# Final Exam – Math 225

Fall 2013 –

**Exercise 1:** Solve the given initial value problem and give the largest interval I over which the solution is defined:

$$\left\{\begin{matrix}\left(x+1\right)\frac{dy}{dx}+y=lnx\\y\left(1\right)=10\\ \end{matrix}\right.$$

**Exercise 2**: Solve the given initial value problem

$$\left\{\begin{matrix}4 y^{''}-4 y^{'}-3y=0\\y\left(0\right)=1, \\y^{'}\left(0\right)=5 \end{matrix}\right.$$

**Exercise 3**: Solve the given differential equation

$$ y^{''}+2 y^{'}+y=e\^x$$

**Exercise 4**: Solve the given differential equation by variation of parameters

$$ y^{''}+y=tanx$$

**Exercise 5**: Solve the given system of differential equations

$$\left\{\begin{matrix} 2x^{'}-5x+ y^{'}=e^{t}\\ x^{'}-x+ y^{'}=5e^{t}\\ \end{matrix}\right.$$

**Exercise 6**: Solve the given differential equation using power series

$$ y^{'}=xy$$

**Exercise 7**:

1. Find the Laplace transform of the function $f\left(t\right)=2t^{4}$
2. Find the inverse Laplace transform $L^{-1}\{\frac{s+1}{s^{2}-4s}\}$
3. Use Laplace transform to solve the given differential equation $ y^{'}+6y=e^{4t} $