# Second Midterm 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:

$$\left\{\begin{matrix}x \frac{dy}{dx}+4y=x^{3}-x\\y\left(1\right)=0\\ \end{matrix}\right.$$

Exercise 2:

Solve the given initial value problem

$$\left\{\begin{matrix}\left(e^{x}+y\right)dx+\left(2+x+ye^{y}\right)dy=0\\y\left(0\right)=1\\ \end{matrix}\right.$$

Exercise 3:

Solve the given initial value problem by finding an appropriate integrating factor

$$\left\{\begin{matrix}xdx+\left(x^{2}y+4y\right)dy=0\\y\left(4\right)=0\\ \end{matrix}\right.$$

Exercise 4:

Solve the given differential equation by using an appropriate substitution

$$x^{2}\frac{dy}{dx}-2xy=3y^{4}$$

Exercise 5:

Let $y\_{1}\left(x\right)=x;y\_{2}\left(x\right)=x^{-2 };y\_{3}\left(x\right)=x^{-2 } lnx$

1. Verify that$ y\_{1},y\_{2} and y\_{3}$ form a fundamental set of solutions of the differential equation

$x^{3} y^{'''}+6x^{2} y^{''}+4x y^{'}-4y=0$ On $(0,\infty )$

b) Form the general solution.