**Notre Dame University**

**MAT 235**

**Ordinary Differential Equations**

 **Exam I**

**Wednesday July 13, ‏2016**

**Duration: 60 minutes**

**Name:**

**Section:**

**Instructor:**

**Grade:**

# **Directions:**

1. Calculators are **not** allowed.
2. Turn off your mobile phones.
3. **(12 points)** Determine the largest region of the $xy$-plane for which the differential equation



would have a unique solution whose graph passes through a point $\left(x\_{0},y\_{0}\right)$ in the region.

1. **(12 points)** Determine whether the piecewise-defined function

$$y=\left\{\begin{array}{c}0, x<0\\x, x\geq 0\end{array}\right.$$

 is a solution of the initial-value problem

$$xy^{'}=y, y\left(0\right)=0$$

 on $\left(-\infty ,\infty \right)$.

1. **(14 points)** Solve the differential equation

$$\left(1-2x+y\right)dx-\left(2x-y\right)dy=0$$

1. **(18 points)** Solve the initial-value problem



1. **(20 points)** Solve the differential equation

$$\left(2x+y\right)dx+\left(y-4x\right)dy=0$$

1. **(24 points)** Solve the differential equation

$\frac{dy}{dx}=\frac{y^{2}+xy^{3}}{xy-y^{2}-y^{4}\cos(y)}$