MAT 361 students: Turn in by Monday Noon #1, 2, 3, 6 & 9 below and Problems 1-7 on the next page

MAT 361 Final Exam 2012

Directions: Do your work on pages provided at the rate of one problem pe = page. Assemble your pages in order with your name on each page before turning your work. Attempt all problems. Show all work for partial credit purposes.

1. Solve $\frac{dy}{dx} + 2xy = 7x$.

2. Solve $2x + \cos(xy^3)y^3 + (3xy^2\cos(xy^3) + 4y^3)\frac{dy}{dx} = 0$.

3. Solve $\frac{dy}{dx} = (y^2 - 2x^2)/(x^2)$.

4. Solve $y'' + 3y' - 10y = 3e^{-5x} + x$.

5. Solve $y^{(4)} + 4y^{(2)} - 32y = 0$.

6. Use Euler's method to estimate $y(1.1)$ where $\frac{dy}{dx} = y^2 - 2x^2$. If $y(1) = 3$. Use a stepsize of 0.1.

7. Find the first 5 terms in the power series solution to $y'' + x^2y' - 10y = 0$ if $y(0) = 1$ and $y'(0) = 0$.

8. Solve using Laplace transforms $y'' + 8y' + 15y = e^{-3x}$ if $y(0)=0$ and $y'(0) = 0$.

9. Ginger is given a $1,000,000 account where interest is added continuously at a rate of .05 times the size of the account. If Ginger continuously withdraws money from the account at the rate of $100,000 per year, when will the balance in the account become zero?

(1) $\frac{dy}{dx} - y = 2xe^x$, $y(0) = 1$

(2) $2xy^3 + \left[3x^2y^2 + 2y\cos(y^2)\right]\frac{dy}{dx} = 0$

(3) $2xy^2\cos(x^2y^3) + \left[3x^2y\cos(x^2y^3) + 2\right]\frac{dy}{dx} = 0$

(4) $\frac{dy}{dx} = \frac{x^2\tan y + \tan y}{x^3 + x}$

(5) $\frac{dy}{dx} = \frac{y\ln y - y\ln x}{x}$

(6) $\frac{dy}{dx} - \frac{2}{x}y = -xy^3$

(7) Sketch the equilibrium solutions to

$$\frac{dy}{dx} = (y-1)(y-3)^2(y-5)$$

and the solutions where $y(0) = 0$, $y(0) = 2$, $y(0) = 4$ and $y(0) = 6$.