MAT 212, Quiz #3, Spring 2017 Name KEY

**Instructions:** Show all work. Give exact answers unless specifically asked to round. Be sure to answer all parts of each question.

1. Solve the system of equations $\begin{cases} 2x - 3y = 11 \\ 4x + 7y = 18 \end{cases}$ by row-reducing.

$\begin{bmatrix} 2 & -3 & | & 11 \\ 4 & 7 & | & 18 \end{bmatrix}$

$-2R_1 + R_2 \to R_2$

$\begin{bmatrix} 2 & -3 & | & 11 \\ 0 & 13 & | & -4 \end{bmatrix}$

$-13R_2 \to R_2$

$\begin{bmatrix} 2 & -3 & | & 11 \\ 0 & 1 & | & -4/13 \end{bmatrix}$

$3R_2 + R_1 \to R_1$

$\begin{bmatrix} 2 & 0 & | & 131/13 \\ 0 & 1 & | & -4/13 \end{bmatrix}$

$\frac{1}{2}R_1 \to R_1$

$\begin{bmatrix} 1 & 0 & | & 131/26 \\ 0 & 1 & | & -4/13 \end{bmatrix}$

2. Classify the differential equations by i) order, ii) linearity, and iii) ordinary or partial.
   a. $(y')^2 + y^2 = 1$ 1st order, nonlinear, ordinary

   b. $x^2y'' + xy' - y = \ln x$ 2nd order, linear ordinary

   c. $u_{xy} + u_{yy} = u_x$ 2nd order, linear, partial

3. Solve by separation $\frac{dy}{dx} = 3x^2(y^2 + 1)$

$\int \frac{dy}{y^2+1} = \int 3x^2 dx$

$\arctan y = x^3 + C$

4. Solve by the method of integrating factors $xy' + 3y = 2x^5$.

$y' + \frac{3}{x} = 2x^4$

$\mu = e^{\int \frac{3}{x} dx} = e^{3\ln x} = e^{\ln x^3} = x^3$

$x^3y' + 3x^2y = 2x^7$

$\int (x^3y)' = \int 2x^7$

$x^3y = \frac{1}{4}x^8 + C$

$y = \frac{1}{4}x^5 + \frac{C}{x^3}$