**Math 252 Spring 2012**

**Homework 5 Supplement**

Solve the following initial value problems:

1. $\begin{cases} 3x^2 + 6xy + (3x^2 + 2y)\frac{dy}{dx} = 0 \\ y(0) = 1 \end{cases}$.
2. $\begin{cases} (1 + t^2)\sec^2(y)\frac{dy}{dt} = -2t\tan y - te^{t^2} \\ y(0) = \frac{\pi}{4} \end{cases}$.
3. $\begin{cases} \frac{e^t}{y}\frac{dy}{dt} = t\sin t - e^t\log(y) \\ y(0) = 1 \end{cases}$.
4. $\begin{cases} 3\log(1 + t^2)y^2\frac{dy}{dt} = -\frac{2ty^3}{1+t^2} - 5t^4 \\ y(1) = 1 \end{cases}$.

Solutions:

1. $y(x) = -\frac{3}{2}x^2 + \frac{1}{2}\sqrt{9x^4 - 4x^3 + 4}$.
2. $y(t) = -\arctan\left(\frac{e^{t^2} - 3}{2(1 + t^2)}\right)$.
3. $y(t) = \exp\left(\frac{\sin(t) - t\cos(t)}{e^t}\right)$.
4. $y(t) = \left(\frac{(-t^5 + 1 + \log 2)}{\log(1 + t^2)}\right)^{1/3}$.