MATH 3430 002 - QUIZ TH (TAKE HOME)

Due: In class, 2:00pm, November 18th, 2015. Absolutely no papers after this will be accepted.

Exercise 1 (Series Solution). (#6 of §2.8) Find a series solution to the following initial value problem, and its interval of convergence.

$$\frac{d^2 y}{dt^2} + t^2 y = 0; \quad y(0) = 2, y'(0) = -1.$$

Exercise 2 (Method of Frobenius). (#8 of §§2.8.2) Find a series solution to the following differential equation.

$$2t\frac{d^2 y}{dt^2} + (1 - 2t)\frac{dy}{dt} - y = 0, \quad (t > 0).$$

Exercise 3 (Laplace Transform). (#10 of §2.6) An object with mass 1 units is attached to a spring with spring constant 64 units. Assume that the system has no friction/resistance/drag, and that at time $t = 0$, the system is at rest in equilibrium. At time $t = 0$, a force $F(t) = \frac{1}{2}t$ is applied until time $t = 7\pi/16$, after which the force is removed. What is the position $y(t)$ of the object with respect to time for $t \geq 0$ (with the y-axis pointing downward, and $y = 0$ corresponds to the equilibrium position)?