Fall 2017 Total Points: 25 Math 20D Exam 1A

Name: _____ PID: _____

- Print your *NAME* on every page and write your *PID* in the space provided above.
- Show all of your work in the spaces provided. No credit will be given for unsupported answers, even if correct.
- No calculators, tablets, phones, or other electronic devices are allowed during this exam. You may use one page of handwritten notes, but no books or other assistance.

(1 pt) 0. Follow the instructions on this exam and any additional instructions given during the exam.

(6 pt) 1. Give an explicit solution to the differential equation: $ty' - y = t^2 e^t, \quad t > 0.$

(6 pt) 2. (a) Find the general solution to the autonomous differential equation $\dfrac{dy}{dt} = y^2 - 1$. You may use the fact that $\frac{1}{y^2-1} = \frac{1/2}{y-1} - \frac{1/2}{y+1}$, and leave your answer in implicit form.

(b) Use a phase line/phase diagram to compute $\lim_{t\to\infty} \phi(t)$ for the solution ϕ to the initial value problem $\frac{dy}{dt} = y^2 - 1, \quad y(0) = 3$

(6 pt) 3. Use the integrating factor $\mu(x, y) = 2y$ to solve the IVP. Leave your answer in implicit form.

$$\frac{x^3}{2y} + ye^x + (1 + 2e^x)\frac{dy}{dx} = 0, \quad y(0) = 1.$$

(6 pt) 4. Solve the initial value problem: $y'' - y' + y = 0, \quad y(0) = 1, \quad y'(0) = 3.$