

- Please put your name, ID number, and section number (or time) on your blue book. **If you fail to do this, you will probably get your exam back late.**
- The first page of your blue book may contain notes. No other paper is allowed.
- **You must show your work to receive credit.**
- *Remember to watch out for division by zero!*

1. (84 pts) Solve each of the following differential equations. If no initial conditions are given, find the general solution. You may find the following integral useful

$$\int x^n e^{ax} dx = \frac{x^n e^{ax}}{a} - \int \frac{nx^{n-1} e^{ax}}{a} dx.$$

- (a)  $x dx + 2ye^{-x} dy = 0$ ,  $y(0) = 2$ .
  - (b)  $x dt = (3x^2 - t)dx$ .
  - (c)  $ye^x dx + (y + e^x)dy = 0$ .
  - (d)  $dy = 2xy^2 dx$ ,  $y(0) = 0$ .
  - (e)  $y'' - 4y' - 5y = 0$ .
  - (f)  $y'' - 4y' + 5y = 0$ ,  $y(0) = 0$ ,  $y'(0) = 1$ .
2. (16 pts) This problem deals with the differential equation

$$y' = y - y^3.$$

- (a) What are its equilibrium points?
- (b) Which equilibrium points are stable and which are unstable?
- (c) If  $y(0) = 1/2$ , what is  $\lim_{t \rightarrow \infty} y(t)$ ? Give a reason for your answer.

The final is 8–11 AM on Tuesday March 21st. **Note the room for your section.**

The exam is in **Solis 107** for sections A01 and A02 (Jason Bell).  
The exam is in **Solis 107** for sections A03 and A04 (Larry Bassel).  
The exam is in **HSS 2250** for sections A05 and A06 (Pete Couperus).