

- Please put your name, ID number, and section number (or time) on your blue book.
- The first page of your blue book may contain notes. No other paper is allowed.
- **Calculators are NOT allowed.**
- You must show your work to receive credit.

1. (75 pts) Solve each of the following differential equations. If no initial conditions are given, find the general solution.

(a) $e^{x+y} dy + dx = 0$.

(b) $t dy + (y - e^t) dt = 0$ with $y(1) = 1$.

(c) $2xy dy + (x^2 - y^2) dx = 0$.

(d) $y'' - 3y' + 2y = 2$ with $y(0) = 0$ and $y'(0) = 1$.

(e) $y'' - 3y' + 2y = 2$ with $y(0) = 1$ and $y'(0) = 0$.

2. (25 pts) (a) Find the general solution to $y''(t) + \omega^2 y(t) = 0$, where ω is a nonzero constant.

(b) One solution to

$$y''(t) + \omega^2 y(t) = 0 \quad \text{with} \quad y(0) = y(1) = 0$$

is $y(t) = 0$ for all t . For what *nonzero* values of ω does the equation have another solution?