

Fall, 2001 – Exam 1 Answers

1. (a) Separation of variables.

(b) $-e^{-y} = \frac{1}{2}t^2 - \ln|t| + C$ where C is any number

(c) $-e^{-y} = \frac{1}{2}t^2 - \ln|t| - \frac{1}{2} - \frac{1}{e}$

2. (a) $y_{n+1} = y_n + \frac{1}{10}(-t_n y_n + y_n^2)$

(b) $y(1) = 1, y(1.1) \approx 1$

3. (a) $y = c_1 e^{-x} + c_2 x e^{-x}$

(b) $y = -\frac{3}{16}e^{2x} - \frac{7}{48}e^{-2x} + \frac{1}{3}e^x - \frac{1}{4}x$

4. This problem doesn't seem to have a clean solution. I get the following for $y(x)$:

$$y(x) = e^{-x^2/2} \left[\int x^2 e^{x^2/2} dx + C \right]$$

The integral above cannot be computed easily.

5. $\frac{dA}{dt} = 6e^{-t} - \frac{5}{2000 - 3t}A, A(0) = 10$