# Fall, 1996 – Final Exam Answers

1. (a) $y_h(x) = c_1 + c_2 e^{-2x}$

   (b) $y_p(x) = \dfrac{3}{2}x^2 - \dfrac{3}{2}x$

   (c) $y(x) = y_h(x) + y_p(x)$

2. $2\sqrt{e^y + 3} = 5 - \cos x$

3. (a) $y(x) = c_1 x + c_2 x \ln x$

   (b) $x(t) = c_1 e^{-3t} + c_2 e^{2t},\ y(t) = -c_1 e^{-3t} + \dfrac{2}{3} c_2 e^{2t}$

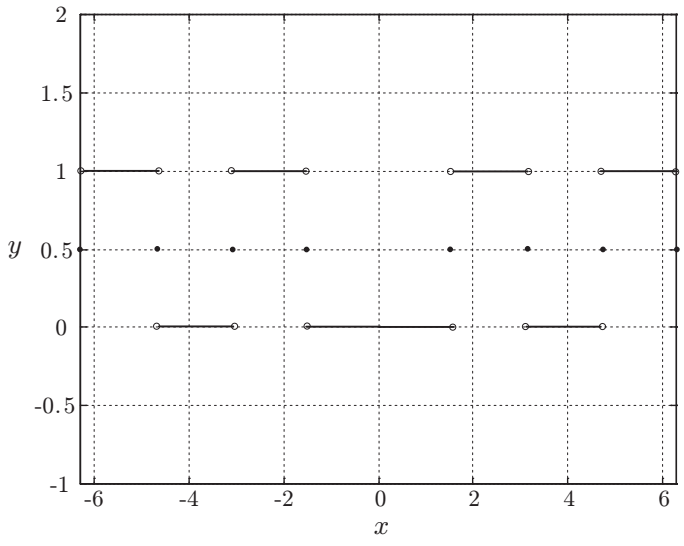
4. $L = \dfrac{\pi}{4}$

5. (a) $Y(s) = \dfrac{s + 4 + \frac{2}{s^2+4} + \frac{24}{s^5} - \frac{24}{s^4} + \frac{12}{s^3} - \frac{4}{s^2} + \frac{1}{s}}{s^2 + 4s + 8}$

   (b) $A + Bt + Ct^2 + De^{2t} + Ee^{-t} + \displaystyle\int_0^t \cos(t - v) g(v)\, dv$

6. (a) $f(x) = \dfrac{1}{2} + \displaystyle\sum_{k=1}^{\infty} \frac{2(-1)^{k+1}}{(2k-1)\pi} \cos(2k-1)x$

   (b)




7. $x(t) = 20 - 20e^{-t/2} - 10e^{-(t-5)/2} u(t-5)$

8. $u(x,t) = 4 - 2e^{-9t} \cos 3x + 7e^{-16t} \cos 4x$