1. (10 points) Solve $u_{xx} + u_{yy} = 0$ if u(x,0) = 0, u(x,1) = 0, $u(0,y) = \sin(2\pi y)$, and u(3,y) = 0. Show the steps discussed in class.

2. (6 points) Solve $u_{xx} + u_{yy} = 0$ if u(x, 0) = 0, u(x, 1) = 0, u(0, y) = 0, and $u(3, y) = 4\sin(5\pi y)$. You may skip steps.

3. (2 points) Write the solution for $u_{xx} + u_{yy} = 0$ if u(x,0) = 0, u(x,1) = 0, $u(0,y) = \sin(2\pi y)$, and $u(3,y) = 4\sin(5\pi y)$. You do not need to show any work.

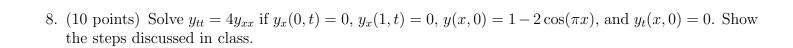
4. (9 points) Solve $y''(t) + 6y'(t) + 8y = (t^2 - 1)\delta(t - 2)$ if y(0) = 2 and y'(0) = 1.

5. (8 points) Solve $y(t) = H(t-2) - \int_0^t (t-\tau)y(\tau) d\tau$.

6. (9 points) Find the eigenvalues and eigenfunctions for $x''(t) + \lambda x(t) = 0$, $x(t) = 0$	$(0) = 0$, and $x'(\pi) = 0$.
Show detailed work.	

7. (8 points) Solve $u_t = u_{xx}$ if u(0,t) = 0, u(2,t) = 0, and $u_t(x,0) = x$. Show the steps discussed in

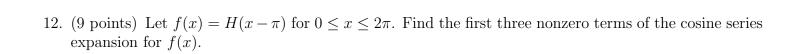
class.



9. (6 points) Use past work to help solve $y_{tt} = 4y_{xx}$ if $y_x(0,t) = 0$, $y_x(1,t) = 0$, y(x,0) = 0, and $y_t(x,0) = 1 - 2\cos(\pi x)$.

10. (8 points) Use the definition of Laplace transform to show that $\mathcal{L}\{f'(t)\} = s\mathcal{L}\{f(t)\} - f(0)$.

11. (8 points) Find $\mathcal{L}^{-1}\left\{\frac{s-1}{s^2(s^2+1)}\right\}$.



13. (9 points) Solve $u_t = u_{xx}$ if $u_x(1,t) = 0$, $u_x(2,t) = 0$, and $u(x,0) = \cos(\pi x)$. Show the steps discussed in class.