FINAL EXAM (POONEN) - ANSWER KEY

PEYAM RYAN TABRIZIAN

Multiple Choice:

(1) E
(2) B
(3) A
(4) C
(5) TRUE
(6) FALSE
(7) TRUE
(8) FALSE
(9) YES, 1
(10) NO
(11) NO
(12) YES, ∞
(13) YES, 1
(14) E
(15) D
(16) A

(17)

$$\mathcal{B} = \left\{ \begin{bmatrix} -2 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} -\frac{1}{3} \\ -\frac{2}{3} \\ \frac{2}{3} \end{bmatrix}, \begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \\ \frac{2}{3} \end{bmatrix} \right\}$$

Note: The only difference between this problem and what we've usually been doing is that when you apply the Gram-Schmidt proacess for the eigenspace corresponding to $\lambda = 0$, you have to choose:

$$\mathbf{u_1} = \begin{bmatrix} -\frac{2}{3} \\ \frac{2}{3} \\ \frac{1}{3} \end{bmatrix}$$

And $\mathbf{u_2}$ is either one of the other eigenvectors you found (just choose your favorite one!)

(18) (a)

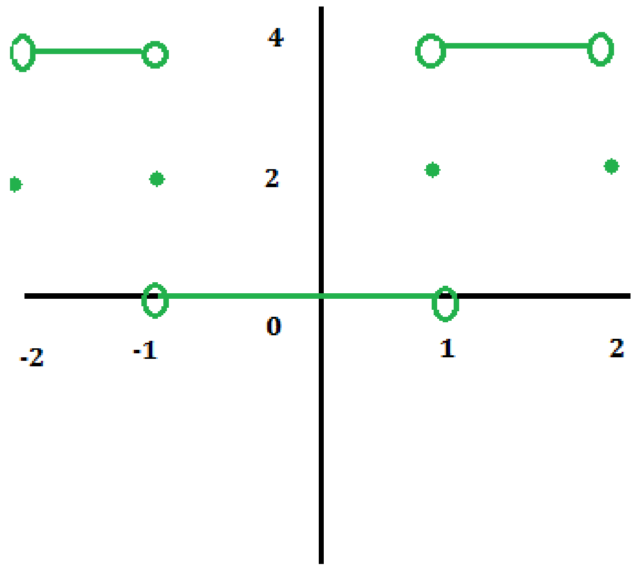
$$A_0 = 4, \quad A_1 = -\frac{8}{\pi}, \quad A_3 = \frac{8}{3\pi}, \quad A_5 = -\frac{8}{5\pi}$$

Date: Monday, December 12th, 2011.

Note: All the B_m terms are 0 because f is an even function (we want a cosine series)

(b) $\frac{0+4}{2} = 2$

54/Practice Exams/Poonengraph.png



(19) Use generalized eigenvectors:

$$\mathbf{x}(t) = e^{3t}\begin{bmatrix}2\\1\end{bmatrix} + te^{3t}\begin{bmatrix}2\\1\end{bmatrix} + e^{3t}\begin{bmatrix}-1\\0\end{bmatrix}$$

(20)

$$u(x,t) = 5e^{-\frac{t^2}{2}1^2}\sin(x) + 7e^{-\frac{t^2}{2}(2)^2}\sin(2x) = 5e^{-\frac{t^2}{2}}\sin(x) + 7e^{-2t^2}\sin(2x)$$