MATH 3A – APPLICATIONS OF DIAGONALIZATION

Here are some extra suggested problems related to the applications of diagonalization.

Problem 1: Let $A$ be the matrix

$$A = \begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}$$

(a) Find $D$ and $P$ such that $A = PDP^{-1}$

(b) Calculate $\sqrt{A}$

**Hint:** $\sqrt{A} = A^{\frac{1}{2}}$. Also, you can find solutions at the end of the $B$ matrix lecture notes (Lecture 20), as well as under the following link: Matrix Square root

(c) Calculate $e^A$

**Hint:** Same thing, but replace $\sqrt{}$ by $e$. You can find a similar solution on Matrix Exponential

(d) Calculate $\cos(A)$

**Hint:** Same thing, but replace $e$ with $\cos$. You can find a similar solution on cos of matrix

Of course, you can calculate other fun things, like $\ln(A)$, $\tan^{-1}(A)$, basically whatever you want :)

Problem 2: Suppose $F_n$ satisfies $F_{n+1} = 5F_n - 6F_{n-1}$ with $F_0 = 2$ and $F_1 = 5$. Find a formula for $F_n$. I believe the answer is $F_n = 2^n + 3^n$.

Problems 3 and 4: Check out Problem 10 on the Peyam 1 and Peyam 2 Final Exams on my webpage (which were the finals I gave out last winter)

---

*Date: Friday, November 15, 2019.*