S14 Final Exam Problem 1
Linear Algebra, Dave Bayer

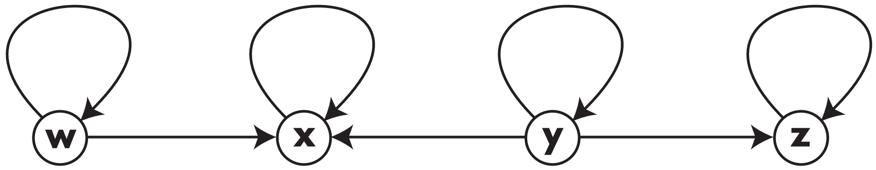
Exam 01

exam01e4p1

[Reserved for Score]

Name ____________________ Uni ____________________

[1] Using matrix multiplication, count the number of paths of length ten from y to z.



S14 Final Exam Problem 2
Linear Algebra, Dave Bayer

Exam 01

exam01e4p2

[Reserved for Score]

[2] Find the 3×3 matrix that projects orthogonally onto the plane

$$x - z \ = \ 0$$

S14 Final Exam Problem 3
Linear Algebra, Dave Bayer

Exam 01

exam01e4p3

[Reserved for Score]

[3] Find $f(n)$, where $f(n)$ is the determinant of the $n \times n$ matrix in the sequence

$$\begin{bmatrix} 3 \end{bmatrix} \quad \begin{bmatrix} 3 & 2 \\ 1 & 3 \end{bmatrix} \quad \begin{bmatrix} 3 & 2 & 0 \\ 1 & 3 & 2 \\ 0 & 1 & 3 \end{bmatrix} \quad \begin{bmatrix} 3 & 2 & 0 & 0 \\ 1 & 3 & 2 & 0 \\ 0 & 1 & 3 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix} \quad \begin{bmatrix} 3 & 2 & 0 & 0 & 0 \\ 1 & 3 & 2 & 0 & 0 \\ 0 & 1 & 3 & 2 & 0 \\ 0 & 0 & 1 & 3 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}$$

Your final answer should be in the form $\quad f(n) = a\, r^n + b\, s^n$

S14 Final Exam Problem 4
Linear Algebra, Dave Bayer

Exam 01

exam01e4p4

[Reserved for Score]

[4] Find e^{At} where A is the matrix

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 0 & 2 & 0 \\ 2 & 2 & 2 \end{bmatrix}$$

S14 Final Exam Problem 5
Linear Algebra, Dave Bayer

Exam 01

exam01e4p5

[Reserved for Score]

[5] Find e^{At} where A is the matrix

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 0 \\ 2 & 2 & 1 \end{bmatrix}$$

S14 Final Exam Problem 6
Linear Algebra, Dave Bayer

Exam 01

exam01e4p6

[Reserved for Score]

[6] Solve the differential equation $y' = Ay$ where

$$A \;=\; \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 1 & 0 & 1 \end{bmatrix}, \qquad y(0) \;=\; \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

S14 Final Exam Problem 7
Linear Algebra, Dave Bayer

Exam 01

exam01e4p7

[Reserved for Score]

[7] Solve the differential equation $y' = Ay$ where

$$A \;=\; \begin{bmatrix} -2 & 2 & -1 \\ -1 & 1 & -2 \\ -1 & 1 & 1 \end{bmatrix}, \qquad y(0) \;=\; \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$$

S14 Final Exam Problem 8
Linear Algebra, Dave Bayer

Exam 01

exam01e4p8

[Reserved for Score]

[8] Express the quadratic form

$$3x^2 \; + \; 2xy \; + \; 2y^2 \; + \; 2yz \; + \; 3z^2$$

as a sum of squares of othogonal linear forms.