

## Assignment #15

15    3.4    p 271    # 1, 2, 4, 8, 12, 56, 58, 60, 64

1. The product is the  $3 \times 3$  identity matrix.

$$2. \quad C = \begin{bmatrix} 2 & -4 & 12 \\ 0 & 6 & -12 \\ 1 & -2 & 3 \end{bmatrix} \quad D = \frac{1}{6} \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & -4 \\ 1 & 0 & -2 \end{bmatrix}$$

$$CD = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \text{So, } C \text{ and } D \text{ are inverses.}$$

$$4. \quad D = \begin{bmatrix} 0 & 2 & -6 \\ -3 & 0 & 3 \\ 0 & -2 & 0 \end{bmatrix} \quad C = \begin{bmatrix} -2/3 & -4/3 & -2/3 \\ 0 & 0 & -2 \\ -2/3 & 0 & -2/3 \end{bmatrix}$$

$$CD \neq \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \text{So, } C \text{ and } D \text{ are not inverses.}$$

$$8. \quad A^{-1} = \frac{1}{4(9) - 5(7)} \begin{bmatrix} 9 & -5 \\ -7 & 4 \end{bmatrix} = \begin{bmatrix} 9 & -5 \\ -7 & 4 \end{bmatrix}$$

$$12. \quad A^{-1} = \frac{1}{6(1) - (-4)(-1)} \begin{bmatrix} 1 & 4 \\ 1 & 6 \end{bmatrix} = \begin{bmatrix} 1/2 & 2 \\ 1/2 & 3 \end{bmatrix}$$

$$56. \quad A^{-1} = \begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}, \quad \begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 157 & 73 & 147 & 63 & 119 \\ 59 & 29 & 58 & 24 & 44 \end{bmatrix} = \begin{bmatrix} 19 & 1 & 4 & 6 & 18 \\ 20 & 14 & 27 & 9 & 13 \end{bmatrix}$$

19 20 1 14 4 27 6 9 18 13

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$$58. \quad A^{-1} = \begin{bmatrix} -2 & -5 & 4 \\ 1 & 4 & -3 \\ 1 & -3 & 2 \end{bmatrix}, \quad \begin{bmatrix} -2 & -5 & 4 \\ 1 & 4 & -3 \\ 1 & -3 & 2 \end{bmatrix} \cdot \begin{bmatrix} 49 & 49 & 39 \\ 165 & 154 & 162 \\ 231 & 220 & 226 \end{bmatrix} = \begin{bmatrix} 1 & 12 & 16 \\ 16 & 5 & 9 \\ 16 & 27 & 5 \end{bmatrix}$$

1 16 16 12 5 27 16 9 5

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$$60. \quad \begin{bmatrix} u \\ r \end{bmatrix} = \begin{bmatrix} 0.90 & 0.30 \\ 0.10 & 0.70 \end{bmatrix}^{-1} \begin{bmatrix} u_0 \\ r_0 \end{bmatrix} \quad \text{where} \quad \begin{bmatrix} u \\ r \end{bmatrix} = \begin{bmatrix} 0.60 \\ 0.40 \end{bmatrix}.$$

$$\begin{bmatrix} u \\ r \end{bmatrix} = \frac{1}{0.63 - 0.03} \begin{bmatrix} 0.7 & -0.3 \\ -0.1 & 0.9 \end{bmatrix} \begin{bmatrix} 0.60 \\ 0.40 \end{bmatrix} = \frac{1}{0.6} \begin{bmatrix} 0.30 \\ 0.30 \end{bmatrix} = \begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix} \quad \text{Thus } u = 50\% \text{ and } r = 50\%.$$

64. Let  $x$  = cc of 40% solution and  $y$  = cc of 10% solution.

$$x + y = 25$$

$$0.4x + 0.1y = 0.28(25) = 7$$

$$A^{-1} = \frac{1}{0.1 - 0.4} \begin{bmatrix} 0.1 & -1 \\ -0.4 & 1 \end{bmatrix} = \begin{bmatrix} -1/3 & 10/3 \\ 4/3 & -10/3 \end{bmatrix}, \quad \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1/3 & 10/3 \\ 4/3 & -10/3 \end{bmatrix} \begin{bmatrix} 25 \\ 7 \end{bmatrix} = \begin{bmatrix} 15 \\ 10 \end{bmatrix}$$

Use 15 cc of 40% solution and 10 cc of 10% solution.