Chapter 2- Answers to even problems.

Section 2.1:

2. Linear

4. $\begin{bmatrix} 1 & 3 & -3 \\ 2 & -9 & 1 \\ 4 & -9 & -2 \end{bmatrix}$.

6. Linear $\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$.

8. $A^{-1} = \begin{bmatrix} -20 & 7 \\ 3 & -1 \end{bmatrix}\}$

16. Dilation by factor of 2.

20. Reflection about the line $y = x$.

24. Rotation counter-clock-wise by $\pi/2$.

28. Dilation only in the direction of y axis by factor 2.

32. $3 \cdot I_n$

Section 2.2:

2. $\begin{bmatrix} \cos(60°) & -\sin(60°) \\ \sin(60°) & \cos(60°) \end{bmatrix}$

4. rotation by $\pi/4$ followed by dilation of factor $\sqrt{2}$.

6. $Proj_L \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \frac{5}{9} \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$

10. $\frac{1}{25} \begin{bmatrix} 16 & 12 \\ 12 & 9 \end{bmatrix}$

24. Done in class.

28. $\begin{bmatrix} ap + br & aq + bs \\ cp + dr & cq + ds \end{bmatrix}$

32. (a) Vector $\vec{v}$ of angle β is rotated by angle α, resulting in vector of angle $\alpha+\beta$. (b) $\begin{bmatrix} \cos(\alpha) & -\sin(\alpha) \\ \sin(\alpha) & \cos(\alpha) \end{bmatrix} \begin{bmatrix} \cos(\beta) \\ \sin(\beta) \end{bmatrix} = \begin{bmatrix} \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta) \\ \cos(\beta)\sin(\alpha) + \cos(\alpha)\sin(\beta) \end{bmatrix} = \begin{bmatrix} \cos(\alpha+\beta) \\ \sin(\alpha+\beta) \end{bmatrix}$

Section 2.3

18. $A^{-1} = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$.

30. Matrix is noninvertible for any b and c.

42. Yes. Yes.

Section 2.4

16. true

18. true

20. false

22. false

24. true

26. Done in class.

28. For example, $A = \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}$.

38. $\begin{bmatrix} -s+t & s \\ 0 & t \end{bmatrix}$ for any scalars s and t.

44. $A = \begin{bmatrix} 8 & -3 \\ -1 & 1 \end{bmatrix}$.

50. (a) $EA = \begin{bmatrix} a & b & c \\ -3a+d & -3b+e & -3c+f \\ g & h & k \end{bmatrix}$. Row operation of $-3R_1 + R_2 \to R_2$.

(b) $\frac{1}{4}R_2 \to R_2$

(c) For example, if $E = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, then EA swaps the second and third row of A.

(d) See the previous parts.

52. (a) See problem #50. (b) $E_1E_2E_3A = I_2$ where $E_3 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, $E_2 = \begin{bmatrix} 1 & 0 \\ 0 & \frac{1}{2} \end{bmatrix}$ and $E_1 = \begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix}$

66. In order for A to be invertible A_{11} and A_{22} must be invertible.

$$A^{-1} = \begin{bmatrix} A_{11}^{-1} & 0 \\ A_{22}^{-1}(-A_{21}A_{11}^{-1}) & A_{22}^{-1} \end{bmatrix}$$

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