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2. (a) 4. (b) 0. (c) 1. (d) 1.

4. 1

6. $x = \frac{6}{5}$, $y = \frac{12}{5}$.

8. (a) $\begin{bmatrix} 26 & 42 \\ 34 & 54 \end{bmatrix}$. (b) Same as (a). (c) $\begin{bmatrix} -7 & -12 & 18 \\ 4 & 6 & -8 \end{bmatrix}$.

(d) Same as (c). (e) $\begin{bmatrix} 4 & 8 & -12 \\ -1 & 6 & -7 \end{bmatrix}$.

32. For each product P or Q, the daily cost of pollution control at plant X or at plant Y.

34. (a) \$103,400. (b) \$16,050.

36. (a) 1. (b) 0.

38. $x = 0$ or $x = 1$.

40. $AB = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$, $BA = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$.

T.1. (a) No. If $\mathbf{x} = (x_1, x_2, \ldots, x_n)$, then $\mathbf{x} \cdot \mathbf{x} = x_1^2 + x_2^2 + \cdots + x_n^2 \geq 0$.
(b) $\mathbf{x} = \mathbf{0}$.

T.7. Yes. If $A = [a_{ij}]$ and $B = [b_{ij}]$ are diagonal matrices, then $C = [c_{ij}]$ is diagonal by Exercise T.4. Moreover, $c_{ii} = a_{ii}b_{ii}$. Similarly, if $D = BA$, then $d_{ii} = b_{ii}a_{ii}$. Thus, $C = D$.

8. (a) $\begin{bmatrix} 5 & 17 \\ 6 & -5 \end{bmatrix}$. (b) Same as (a).

(c) $\begin{bmatrix} 1 & 18 & -4 \\ 0 & 11 & -3 \\ -9 & 14 & -12 \end{bmatrix}$. (d) $\begin{bmatrix} 5 & 2 & 4 \\ 2 & 25 & -5 \\ 4 & -5 & 5 \end{bmatrix}$. (e) $\begin{bmatrix} 14 & 8 \\ 8 & 21 \end{bmatrix}$.

14. (a) $\begin{bmatrix} -3 & -2 \\ 4 & 1 \end{bmatrix}$. (b) $\begin{bmatrix} -24 & -30 \\ 60 & 36 \end{bmatrix}$.

T.4. Denote the entries of the identity matrix by d_{ij}, so that

$$d_{ij} = \begin{cases} 1 & \text{if } i = 1 \\ 0 & \text{if } i \neq j. \end{cases}$$

Then for $C = AI_n$, $c_{ij} = \sum_{k=1}^{p} a_{ik}d_{kj} = a_{ij}d_{jj}$(all other d_{kj} are zero) $= a_{ij}$, and thus $C = A$.
A similar argument shows that $I_m A = A$.

T.10. (a) $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$. (b) $\begin{bmatrix} \cos 3\theta & \sin 3\theta \\ -\sin 3\theta & \cos 3\theta \end{bmatrix}$. (c) $\begin{bmatrix} \cos k\theta & \sin k\theta \\ -\sin k\theta & \cos k\theta \end{bmatrix}$.

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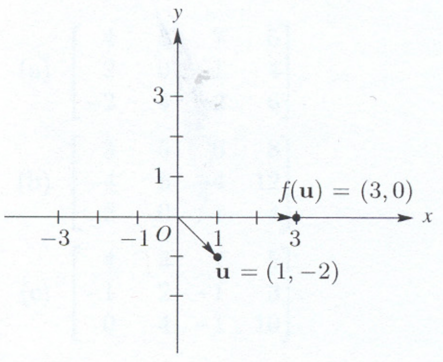
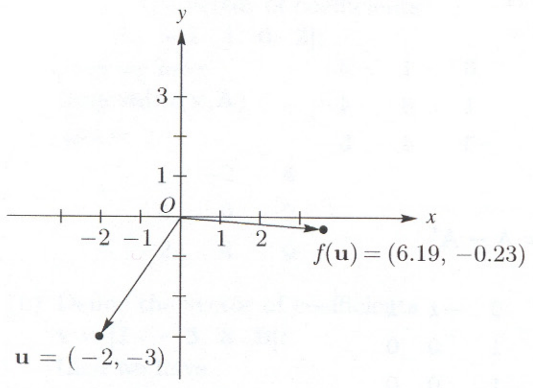
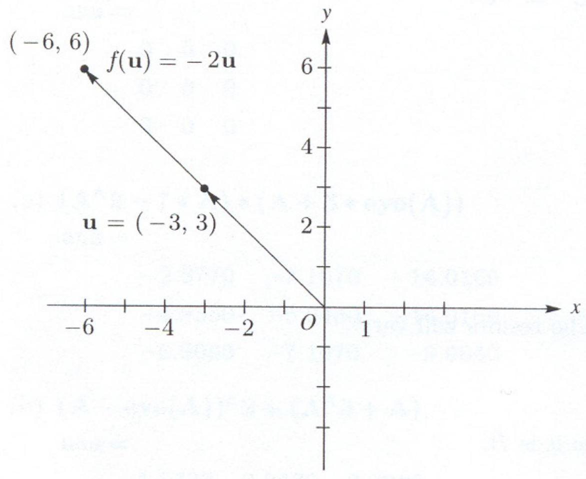
2.



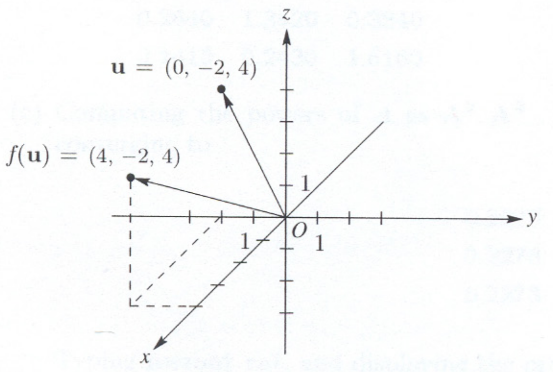
4.



6.



8.



16. (a) Reflection about the line $y = x$.
(b) Reflection about the line $y = -x$.

T.1. (a) $f(\mathbf{u} + \mathbf{v}) = A(\mathbf{u} + \mathbf{v}) = A\mathbf{u} + A\mathbf{v} = f(\mathbf{u}) + f(\mathbf{v})$.
(b) $f(c\mathbf{u}) = A(c\mathbf{u}) = c(A\mathbf{u}) = cf(\mathbf{u})$.
(c) $f(c\mathbf{u} + d\mathbf{v}) = A(c\mathbf{u} + d\mathbf{v}) = A(c\mathbf{u}) + A(c\mathbf{v}) = c(A\mathbf{u}) + d(A\mathbf{v}) = cf(\mathbf{u}) + df(\mathbf{v})$.

T.2. For any real numbers c and d, we have

$$f(c\mathbf{u} + d\mathbf{v}) = A(c\mathbf{u} + d\mathbf{v}) = A(c\mathbf{u}) + A(d\mathbf{v}) = c(A\mathbf{u}) + d(A\mathbf{v}) = cf(\mathbf{u}) + df(\mathbf{v}) = c\mathbf{0} + d\mathbf{0} = \mathbf{0} + \mathbf{0} = \mathbf{0}.$$