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We have over one million books available in our catalogue for you to explore.CoverTitle PageCopyright PageTable of ContentsCHAPTER 1: SYSTEMS OF LINEAR EQUATIONS AND MATRICESCHAPTER 2: DETERMINANTSCHAPTER 3: EUCLIDEAN VECTOR SPACESCHAPTER 4: GENERAL VECTOR SPACESCHAPTER 5: EIGENVALUES AND EIGENVECTORSCHAPTER 6: INNER PRODUCT SPACESCHAPTER 7: DIAGONALIZATION AND QUADRATIC FORMSCHAPTER 8: LINEAR TRANSFORMATIONSCHAPTER 9: NUMERICAL METHODSCHAPTER 10: APPLICATIONS OF LINEAR ALGEBRAEULA Math 11 Edition Howard Anton, Chris Rorres An automobile mechanic  $\mathcal{M}$  and a body shop  $\mathcal{B}$  use each other's services. For each  $\$1.00$  of business that  $\mathcal{M}$  does, it uses  $\$0.25$  of its own services and  $\$0.25$  of  $\mathcal{B}$ 's services, and for each  $\$1.00$  of business that  $\mathcal{B}$  does it uses  $\$0.10$  of its own services and  $\$0.25$  of  $\mathcal{M}$ 's services. (a) Construct a consumption matrix for this economy. (b) How much must  $\mathcal{M}$  and  $\mathcal{B}$  each produce to provide customers with  $\$7000$  worth of mechanical work and  $\$14,000$  worth of body work? Suppose that  $\mathcal{A}$ ,  $\mathcal{B}$ ,  $\mathcal{C}$ ,  $\mathcal{D}$ , and  $\mathcal{E}$  are matrices with the following sizes:  $\mathcal{A}$   $\mathbb{R}^{(4 \times 5)}$ ,  $\mathcal{B}$   $\mathbb{R}^{(4 \times 5)}$ ,  $\mathcal{C}$   $\mathbb{R}^{(5 \times 2)}$ ,  $\mathcal{D}$   $\mathbb{R}^{(4 \times 2)}$ ,  $\mathcal{E}$   $\mathbb{R}^{(5 \times 4)}$ . In each part, determine whether the given matrix expression is defined. For those that are defined, give the size of the resulting matrix. (a)  $\mathcal{B}\mathcal{A}$  (b)  $(\mathcal{A}\mathcal{B})^T$  (c)  $(\mathcal{A}\mathcal{C}+\mathcal{D})$  (d)  $(\mathcal{E}\mathcal{A}\mathcal{C})$  (e)  $(\mathcal{A}-3\mathcal{E})^T$  (f)  $(\mathcal{E}(5\mathcal{B}+\mathcal{A}))$  Classify the matrix as upper triangular, lower triangular, or diagonal, and decide by inspection whether the matrix is invertible. [Note: Recall that a diagonal matrix is both upper and lower triangular, so there may be more than one answer in some parts.] (a)  $\begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$  (b)  $\begin{bmatrix} 0 & 0 \\ 4 & 0 \end{bmatrix}$  (c)  $\begin{bmatrix} -1 & 0 & 2 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & \frac{1}{5} & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$  (d)  $\begin{bmatrix} 3 & -2 & 7 \\ 0 & 0 & 3 \\ 0 & 0 & 8 \end{bmatrix}$  In each part, determine whether the equation is linear in  $x_1$ ,  $x_2$ , and  $x_3$ . (a)  $x_1+5x_2-\sqrt{x_3}=1$  (b)  $x_1+3x_2+x_3=2$  (c)  $x_1=-7x_2+3x_3$  (d)  $x_1^{-2}+x_2^2+8x_3=5$  (e)  $x_1^{\frac{3}{5}}-2x_2+x_3=4$  (f)  $\pi x_1-\sqrt{x_2}=7^{\frac{1}{3}}$  Determine whether the matrix is in row echelon form, reduced row echelon form, both, or neither. (a)  $\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  (b)  $\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  (c)  $\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix}$  (d)  $\begin{bmatrix} 1 & 0 & 3 & 1 \\ 0 & 1 & 2 & 4 \end{bmatrix}$  (e)  $\begin{bmatrix} 1 & 2 & 0 & 3 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  (f)  $\begin{bmatrix} 1 & 2 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$  (g)  $\begin{bmatrix} 1 & -7 & 5 & 5 \\ 0 & 1 & 3 & 2 \end{bmatrix}$  Find the domain and codomain of the transformation  $T: \mathcal{A} \rightarrow \mathcal{A}$  where  $\mathcal{A}$  is the set of all  $3 \times 3$  matrices. (a)  $T(\mathbf{A}) = \mathbf{A}$  (b)  $T(\mathbf{A}) = \mathbf{A}^T$  (c)  $T(\mathbf{A}) = \mathbf{A} + \mathbf{A}^T$  (d)  $T(\mathbf{A}) = \mathbf{A} - \mathbf{A}^T$  (e)  $T(\mathbf{A}) = \mathbf{A}^2$  (f)  $T(\mathbf{A}) = \mathbf{A}^3$  (g)  $T(\mathbf{A}) = \mathbf{A}^4$  (h)  $T(\mathbf{A}) = \mathbf{A}^5$  (i)  $T(\mathbf{A}) = \mathbf{A}^6$  (j)  $T(\mathbf{A}) = \mathbf{A}^7$  (k)  $T(\mathbf{A}) = \mathbf{A}^8$  (l)  $T(\mathbf{A}) = \mathbf{A}^9$  (m)  $T(\mathbf{A}) = \mathbf{A}^{10}$  (n)  $T(\mathbf{A}) = \mathbf{A}^{11}$  (o)  $T(\mathbf{A}) = \mathbf{A}^{12}$  (p)  $T(\mathbf{A}) = \mathbf{A}^{13}$  (q)  $T(\mathbf{A}) = \mathbf{A}^{14}$  (r)  $T(\mathbf{A}) = \mathbf{A}^{15}$  (s)  $T(\mathbf{A}) = \mathbf{A}^{16}$  (t)  $T(\mathbf{A}) = \mathbf{A}^{17}$  (u)  $T(\mathbf{A}) = \mathbf{A}^{18}$  (v)  $T(\mathbf{A}) = \mathbf{A}^{19}$  (w)  $T(\mathbf{A}) = \mathbf{A}^{20}$  (x)  $T(\mathbf{A}) = \mathbf{A}^{21}$  (y)  $T(\mathbf{A}) = \mathbf{A}^{22}$  (z)  $T(\mathbf{A}) = \mathbf{A}^{23}$  (aa)  $T(\mathbf{A}) = \mathbf{A}^{24}$  (ab)  $T(\mathbf{A}) = \mathbf{A}^{25}$  (ac)  $T(\mathbf{A}) = \mathbf{A}^{26}$  (ad)  $T(\mathbf{A}) = \mathbf{A}^{27}$  (ae)  $T(\mathbf{A}) = \mathbf{A}^{28}$  (af)  $T(\mathbf{A}) = \mathbf{A}^{29}$  (ag)  $T(\mathbf{A}) = \mathbf{A}^{30}$  (ah)  $T(\mathbf{A}) = \mathbf{A}^{31}$  (ai)  $T(\mathbf{A}) = \mathbf{A}^{32}$  (aj)  $T(\mathbf{A}) = \mathbf{A}^{33}$  (ak)  $T(\mathbf{A}) = \mathbf{A}^{34}$  (al)  $T(\mathbf{A}) = \mathbf{A}^{35}$  (am)  $T(\mathbf{A}) = \mathbf{A}^{36}$  (an)  $T(\mathbf{A}) = \mathbf{A}^{37}$  (ao)  $T(\mathbf{A}) = \mathbf{A}^{38}$  (ap)  $T(\mathbf{A}) = \mathbf{A}^{39}$  (aq)  $T(\mathbf{A}) = \mathbf{A}^{40}$  (ar)  $T(\mathbf{A}) = \mathbf{A}^{41}$  (as)  $T(\mathbf{A}) = \mathbf{A}^{42}$  (at)  $T(\mathbf{A}) = \mathbf{A}^{43}$  (au)  $T(\mathbf{A}) = \mathbf{A}^{44}$  (av)  $T(\mathbf{A}) = \mathbf{A}^{45}$  (aw)  $T(\mathbf{A}) = \mathbf{A}^{46}$  (ax)  $T(\mathbf{A}) = \mathbf{A}^{47}$  (ay)  $T(\mathbf{A}) = \mathbf{A}^{48}$  (az)  $T(\mathbf{A}) = \mathbf{A}^{49}$  (ba)  $T(\mathbf{A}) = \mathbf{A}^{50}$  (bb)  $T(\mathbf{A}) = \mathbf{A}^{51}$  (bc)  $T(\mathbf{A}) = \mathbf{A}^{52}$  (bd)  $T(\mathbf{A}) = \mathbf{A}^{53}$  (be)  $T(\mathbf{A}) = \mathbf{A}^{54}$  (bf)  $T(\mathbf{A}) = \mathbf{A}^{55}$  (bg)  $T(\mathbf{A}) = \mathbf{A}^{56}$  (bh)  $T(\mathbf{A}) = \mathbf{A}^{57}$  (bi)  $T(\mathbf{A}) = \mathbf{A}^{58}$  (bj)  $T(\mathbf{A}) = \mathbf{A}^{59}$  (bk)  $T(\mathbf{A}) = \mathbf{A}^{60}$  (bl)  $T(\mathbf{A}) = \mathbf{A}^{61}$  (bm)  $T(\mathbf{A}) = \mathbf{A}^{62}$  (bn)  $T(\mathbf{A}) = \mathbf{A}^{63}$  (bo)  $T(\mathbf{A}) = \mathbf{A}^{64}$  (bp)  $T(\mathbf{A}) = \mathbf{A}^{65}$  (bq)  $T(\mathbf{A}) = \mathbf{A}^{66}$  (br)  $T(\mathbf{A}) = \mathbf{A}^{67}$  (bs)  $T(\mathbf{A}) = \mathbf{A}^{68}$  (bt)  $T(\mathbf{A}) = \mathbf{A}^{69}$  (bu)  $T(\mathbf{A}) = \mathbf{A}^{70}$  (bv)  $T(\mathbf{A}) = \mathbf{A}^{71}$  (bw)  $T(\mathbf{A}) = \mathbf{A}^{72}$  (bx)  $T(\mathbf{A}) = \mathbf{A}^{73}$  (by)  $T(\mathbf{A}) = \mathbf{A}^{74}$  (bz)  $T(\mathbf{A}) = \mathbf{A}^{75}$  (ca)  $T(\mathbf{A}) = \mathbf{A}^{76}$  (cb)  $T(\mathbf{A}) = \mathbf{A}^{77}$  (cc)  $T(\mathbf{A}) = \mathbf{A}^{78}$  (cd)  $T(\mathbf{A}) = \mathbf{A}^{79}$  (ce)  $T(\mathbf{A}) = \mathbf{A}^{80}$  (cf)  $T(\mathbf{A}) = \mathbf{A}^{81}$  (cg)  $T(\mathbf{A}) = \mathbf{A}^{82}$  (ch)  $T(\mathbf{A}) = \mathbf{A}^{83}$  (ci)  $T(\mathbf{A}) = \mathbf{A}^{84}$  (cj)  $T(\mathbf{A}) = \mathbf{A}^{85}$  (ck)  $T(\mathbf{A}) = \mathbf{A}^{86}$  (cl)  $T(\mathbf{A}) = \mathbf{A}^{87}$  (cm)  $T(\mathbf{A}) = \mathbf{A}^{88}$  (cn)  $T(\mathbf{A}) = \mathbf{A}^{89}$  (co)  $T(\mathbf{A}) = \mathbf{A}^{90}$  (cp)  $T(\mathbf{A}) = \mathbf{A}^{91}$  (cq)  $T(\mathbf{A}) = \mathbf{A}^{92}$  (cr)  $T(\mathbf{A}) = \mathbf{A}^{93}$  (cs)  $T(\mathbf{A}) = \mathbf{A}^{94}$  (ct)  $T(\mathbf{A}) = \mathbf{A}^{95}$  (cu)  $T(\mathbf{A}) = \mathbf{A}^{96}$  (cv)  $T(\mathbf{A}) = \mathbf{A}^{97}$  (cw)  $T(\mathbf{A}) = \mathbf{A}^{98}$  (cx)  $T(\mathbf{A}) = \mathbf{A}^{99}$  (cy)  $T(\mathbf{A}) = \mathbf{A}^{100}$  (d)  $\begin{bmatrix} 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$  (e)  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$  (f)  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$  (g)  $\begin{bmatrix} 1 & -2 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{bmatrix}$  Classify the matrix as upper triangular, lower triangular, or diagonal, and decide by inspection whether the matrix is invertible. [Note: Recall that a diagonal matrix is both upper and lower triangular, so there may be more than one answer in some parts.] (a)  $\begin{bmatrix} 1 & 4 & 0 \\ 0 & 1 & 7 \end{bmatrix}$  (b)  $\begin{bmatrix} 0 & -3 \\ 0 & 0 \end{bmatrix}$  (c)  $\begin{bmatrix} 4 & 4 & 0 \\ 0 & 0 & \frac{3}{5} \\ 5 & 0 & -2 \end{bmatrix}$  (d)  $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 7 & 0 & 0 & 0 \end{bmatrix}$  Find the domain and codomain of the transformation  $T: \mathcal{A} \rightarrow \mathcal{A}$  where  $\mathcal{A}$  is the set of all  $4 \times 4$  matrices. (a)  $T(\mathbf{A}) = \mathbf{A}$  (b)  $T(\mathbf{A}) = \mathbf{A}^T$  (c)  $T(\mathbf{A}) = \mathbf{A} + \mathbf{A}^T$  (d)  $T(\mathbf{A}) = \mathbf{A} - \mathbf{A}^T$  (e)  $T(\mathbf{A}) = \mathbf{A}^2$  (f)  $T(\mathbf{A}) = \mathbf{A}^3$  (g)  $T(\mathbf{A}) = \mathbf{A}^4$  (h)  $T(\mathbf{A}) = \mathbf{A}^5$  (i)  $T(\mathbf{A}) = \mathbf{A}^6$  (j)  $T(\mathbf{A}) = \mathbf{A}^7$  (k)  $T(\mathbf{A}) = \mathbf{A}^8$  (l)  $T(\mathbf{A}) = \mathbf{A}^9$  (m)  $T(\mathbf{A}) = \mathbf{A}^{10}$  (n)  $T(\mathbf{A}) = \mathbf{A}^{11}$  (o)  $T(\mathbf{A}) = \mathbf{A}^{12}$  (p)  $T(\mathbf{A}) = \mathbf{A}^{13}$  (q)  $T(\mathbf{A}) = \mathbf{A}^{14}$  (r)  $T(\mathbf{A}) = \mathbf{A}^{15}$  (s)  $T(\mathbf{A}) = \mathbf{A}^{16}$  (t)  $T(\mathbf{A}) = \mathbf{A}^{17}$  (u)  $T(\mathbf{A}) = \mathbf{A}^{18}$  (v)  $T(\mathbf{A}) = \mathbf{A}^{19}$  (w)  $T(\mathbf{A}) = \mathbf{A}^{20}$  (x)  $T(\mathbf{A}) = \mathbf{A}^{21}$  (y)  $T(\mathbf{A}) = \mathbf{A}^{22}$  (z)  $T(\mathbf{A}) = \mathbf{A}^{23}$  (aa)  $T(\mathbf{A}) = \mathbf{A}^{24}$  (ab)  $T(\mathbf{A}) = \mathbf{A}^{25}$  (ac)  $T(\mathbf{A}) = \mathbf{A}^{26}$  (ad)  $T(\mathbf{A}) = \mathbf{A}^{27}$  (ae)  $T(\mathbf{A}) = \mathbf{A}^{28}$  (af)  $T(\mathbf{A}) = \mathbf{A}^{29}$  (ag)  $T(\mathbf{A}) = \mathbf{A}^{30}$  (ah)  $T(\mathbf{A}) = \mathbf{A}^{31}$  (ai)  $T(\mathbf{A}) = \mathbf{A}^{32}$  (aj)  $T(\mathbf{A}) = \mathbf{A}^{33}$  (ak)  $T(\mathbf{A}) = \mathbf{A}^{34}$  (al)  $T(\mathbf{A}) = \mathbf{A}^{35}$  (am)  $T(\mathbf{A}) = \mathbf{A}^{36}$  (an)  $T(\mathbf{A}) = \mathbf{A}^{37}$  (ao)  $T(\mathbf{A}) = \mathbf{A}^{38}$  (ap)  $T(\mathbf{A}) = \mathbf{A}^{39}$  (aq)  $T(\mathbf{A}) = \mathbf{A}^{40}$  (ar)  $T(\mathbf{A}) = \mathbf{A}^{41}$  (as)  $T(\mathbf{A}) = \mathbf{A}^{42}$  (at)  $T(\mathbf{A}) = \mathbf{A}^{43}$  (au)  $T(\mathbf{A}) = \mathbf{A}^{44}$  (av)  $T(\mathbf{A}) = \mathbf{A}^{45}$  (aw)  $T(\mathbf{A}) = \mathbf{A}^{46}$  (ax)  $T(\mathbf{A}) = \mathbf{A}^{47}$  (ay)  $T(\mathbf{A}) = \mathbf{A}^{48}$  (az)  $T(\mathbf{A}) = \mathbf{A}^{49}$  (ba)  $T(\mathbf{A}) = \mathbf{A}^{50}$  (bb)  $T(\mathbf{A}) = \mathbf{A}^{51}$  (bc)  $T(\mathbf{A}) = \mathbf{A}^{52}$  (bd)  $T(\mathbf{A}) = \mathbf{A}^{53}$  (be)  $T(\mathbf{A}) = \mathbf{A}^{54}$  (bf)  $T(\mathbf{A}) = \mathbf{A}^{55}$  (bg)  $T(\mathbf{A}) = \mathbf{A}^{56}$  (bh)  $T(\mathbf{A}) = \mathbf{A}^{57}$  (bi)  $T(\mathbf{A}) = \mathbf{A}^{58}$  (bj)  $T(\mathbf{A}) = \mathbf{A}^{59}$  (bk)  $T(\mathbf{A}) = \mathbf{A}^{60}$  (bl)  $T(\mathbf{A}) = \mathbf{A}^{61}$  (bm)  $T(\mathbf{A}) = \mathbf{A}^{62}$  (bn)  $T(\mathbf{A}) = \mathbf{A}^{63}$  (bo)  $T(\mathbf{A}) = \mathbf{A}^{64}$  (bp)  $T(\mathbf{A}) = \mathbf{A}^{65}$  (bq)  $T(\mathbf{A}) = \mathbf{A}^{66}$  (br)  $T(\mathbf{A}) = \mathbf{A}^{67}$  (bs)  $T(\mathbf{A}) = \mathbf{A}^{68}$  (bt)  $T(\mathbf{A}) = \mathbf{A}^{69}$  (bu)  $T(\mathbf{A}) = \mathbf{A}^{70}$  (bv)  $T(\mathbf{A}) = \mathbf{A}^{71}$  (bw)  $T(\mathbf{A}) = \mathbf{A}^{72}$  (bx)  $T(\mathbf{A}) = \mathbf{A}^{73}$  (by)  $T(\mathbf{A}) = \mathbf{A}^{74}$  (bz)  $T(\mathbf{A}) = \mathbf{A}^{75}$  (ca)  $T(\mathbf{A}) = \mathbf{A}^{76}$  (cb)  $T(\mathbf{A}) = \mathbf{A}^{77}$  (cc)  $T(\mathbf{A}) = \mathbf{A}^{78}$  (cd)  $T(\mathbf{A}) = \mathbf{A}^{79}$  (ce)  $T(\mathbf{A}) = \mathbf{A}^{80}$  (cf)  $T(\mathbf{A}) = \mathbf{A}^{81}$  (cg)  $T(\mathbf{A}) = \mathbf{A}^{82}$  (ch)  $T(\mathbf{A}) = \mathbf{A}^{83}$  (ci)  $T(\mathbf{A}) = \mathbf{A}^{84}$  (cj)  $T(\mathbf{A}) = \mathbf{A}^{85}$  (ck)  $T(\mathbf{A}) = \mathbf{A}^{86}$  (cl)  $T(\mathbf{A}) = \mathbf{A}^{87}$  (cm)  $T(\mathbf{A}) = \mathbf{A}^{88}$  (cn)  $T(\mathbf{A}) = \mathbf{A}^{89}$  (co)  $T(\mathbf{A}) = \mathbf{A}^{90}$  (cp)  $T(\mathbf{A}) = \mathbf{A}^{91}$  (cq)  $T(\mathbf{A}) = \mathbf{A}^{92}$  (cr)  $T(\mathbf{A}) = \mathbf{A}^{93}$  (cs)  $T(\mathbf{A}) = \mathbf{A}^{94}$  (ct)  $T(\mathbf{A}) = \mathbf{A}^{95}$  (cu)  $T(\mathbf{A}) = \mathbf{A}^{96}$  (cv)  $T(\mathbf{A}) = \mathbf{A}^{97}$  (cw)  $T(\mathbf{A}) = \mathbf{A}^{98}$  (cx)  $T(\mathbf{A}) = \mathbf{A}^{99}$  (cy)  $T(\mathbf{A}) = \mathbf{A}^{100}$  (d)  $\begin{bmatrix} 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$  (e)  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$  (f)  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$  (g)  $\begin{bmatrix} 1 & -2 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{bmatrix}$  Classify the matrix as upper triangular, lower triangular, or diagonal, and decide by inspection whether the matrix is invertible. [Note: Recall that a diagonal matrix is both upper and lower triangular, so there may be more than one answer in some parts.] (a)  $\begin{bmatrix} 1 & 4 & 0 \\ 0 & 1 & 7 \end{bmatrix}$  (b)  $\begin{bmatrix} 0 & -3 \\ 0 & 0 \end{bmatrix}$  (c)  $\begin{bmatrix} 4 & 4 & 0 \\ 0 & 0 & \frac{3}{5} \\ 5 & 0 & -2 \end{bmatrix}$  (d)  $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 7 & 0 & 0 & 0 \end{bmatrix}$  Find the domain and codomain of the transformation  $T: \mathcal{A} \rightarrow \mathcal{A}$  where  $\mathcal{A}$  is the set of all  $4 \times 4$  matrices. (a)  $T(\mathbf{A}) = \mathbf{A}$  (b)  $T(\mathbf{A}) = \mathbf{A}^T$  (c)  $T(\mathbf{A}) = \mathbf{A} + \mathbf{A}^T$  (d)  $T(\mathbf{A}) = \mathbf{A} - \mathbf{A}^T$  (e)  $T(\mathbf{A}) = \mathbf{A}^2$  (f)  $T(\mathbf{A}) = \mathbf{A}^3$  (g)  $T(\mathbf{A}) = \mathbf{A}^4$  (h)  $T(\mathbf{A}) = \mathbf{A}^5$  (i)  $T(\mathbf{A}) = \mathbf{A}^6$  (j)  $T(\mathbf{A}) = \mathbf{A}^7$  (k)  $T(\mathbf{A}) = \mathbf{A}^8$  (l)  $T(\mathbf{A}) = \mathbf{A}^9$  (m)  $T(\mathbf{A}) = \mathbf{A}^{10}$  (n)  $T(\mathbf{A}) = \mathbf{A}^{11}$  (o)  $T(\mathbf{A}) = \mathbf{A}^{12}$  (p)  $T(\mathbf{A}) = \mathbf{A}^{13}$  (q)  $T(\mathbf{A}) = \mathbf{A}^{14}$  (r)  $T(\mathbf{A}) = \mathbf{A}^{15}$  (s)  $T(\mathbf{A}) = \mathbf{A}^{16}$  (t)  $T(\mathbf{A}) = \mathbf{A}^{17}$  (u)  $T(\mathbf{A}) = \mathbf{A}^{18}$  (v)  $T(\mathbf{A}) = \mathbf{A}^{19}$  (w)  $T(\mathbf{A}) = \mathbf{A}^{20}$  (x)  $T(\mathbf{A}) = \mathbf{A}^{21}$  (y)  $T(\mathbf{A}) = \mathbf{A}^{22}$  (z)  $T(\mathbf{A}) = \mathbf{A}^{23}$  (aa)  $T(\mathbf{A}) = \mathbf{A}^{24}$  (ab)  $T(\mathbf{A}) = \mathbf{A}^{25}$  (ac)  $T(\mathbf{A}) = \mathbf{A}^{26}$  (ad)  $T(\mathbf{A}) = \mathbf{A}^{27}$  (ae)  $T(\mathbf{A}) = \mathbf{A}^{28}$  (af)  $T(\mathbf{A}) = \mathbf{A}^{29}$  (ag)  $T(\mathbf{A}) = \mathbf{A}^{30}$  (ah)  $T(\mathbf{A}) = \mathbf{A}^{31}$  (ai)  $T(\mathbf{A}) = \mathbf{A}^{32}$  (aj)  $T(\mathbf{A}) = \mathbf{A}^{33}$  (ak)  $T(\mathbf{A}) = \mathbf{A}^{34}$  (al)  $T(\mathbf{A}) = \mathbf{A}^{35}$  (am)  $T(\mathbf{A}) = \mathbf{A}^{36}$  (an)  $T(\mathbf{A}) = \mathbf{A}^{37}$  (ao)  $T(\mathbf{A}) = \mathbf{A}^{38}$  (ap)  $T(\mathbf{A}) = \mathbf{A}^{39}$  (aq)  $T(\mathbf{A}) = \mathbf{A}^{40}$  (ar)  $T(\mathbf{A}) = \mathbf{A}^{41}$  (as)  $T(\mathbf{A}) = \mathbf{A}^{42}$  (at)  $T(\mathbf{A}) = \mathbf{A}^{43}$  (au)  $T(\mathbf{A}) = \mathbf{A}^{44}$  (av)  $T(\mathbf{A}) = \mathbf{A}^{45}$  (aw)  $T(\mathbf{A}) = \mathbf{A}^{46}$  (ax)  $T(\mathbf{A}) = \mathbf{A}^{47}$  (ay)  $T(\mathbf{A}) = \mathbf{A}^{48}$  (az)  $T(\mathbf{A}) = \mathbf{A}^{49}$  (ba)  $T(\mathbf{A}) = \mathbf{A}^{50}$  (bb)  $T(\mathbf{A}) = \mathbf{A}^{51}$  (bc)  $T(\mathbf{A}) = \mathbf{A}^{52}$  (bd)  $T(\mathbf{A}) = \mathbf{A}^{53}$  (be)  $T(\mathbf{A}) = \mathbf{A}^{54}$  (bf)  $T(\mathbf{A}) = \mathbf{A}^{55}$  (bg)  $T(\mathbf{A}) = \mathbf{A}^{56}$  (bh)  $T(\mathbf{A}) = \mathbf{A}^{57}$  (bi)  $T(\mathbf{A}) = \mathbf{A}^{58}$  (bj)  $T(\mathbf{A}) = \mathbf{A}^{59}$  (bk)  $T(\mathbf{A}) = \mathbf{A}^{60}$  (bl)  $T(\mathbf{A}) = \mathbf{A}^{61}$  (bm)  $T(\mathbf{A}) = \mathbf{A}^{62}$  (bn)  $T(\mathbf{A}) = \mathbf{A}^{63}$  (bo)  $T(\mathbf{A}) = \mathbf{A}^{64}$  (bp)  $T(\mathbf{A}) = \mathbf{A}^{65}$  (bq)  $T(\mathbf{A}) = \mathbf{A}^{66}$  (br)  $T(\mathbf{A}) = \mathbf{A}^{67}$  (bs)  $T(\mathbf{A}) = \mathbf{A}^{68}$  (bt)  $T(\mathbf{A}) = \mathbf{A}^{69}$  (bu)  $T(\mathbf{A}) = \mathbf{A}^{70}$  (bv)  $T(\mathbf{A}) = \mathbf{A}^{71}$  (bw)  $T(\mathbf{A}) = \mathbf{A}^{72}$  (bx)  $T(\mathbf{A}) = \mathbf{A}^{73}$  (by)  $T(\mathbf{A}) = \mathbf{A}^{74}$  (bz)  $T(\mathbf{A}) = \mathbf{A}^{75}$  (ca)  $T(\mathbf{A}) = \mathbf{A}^{76}$  (cb)  $T(\mathbf{A}) = \mathbf{A}^{77}$  (cc)  $T(\mathbf{A}) = \mathbf{A}^{78}$  (cd)  $T(\mathbf{A}) = \mathbf{A}^{79}$  (ce)  $T(\mathbf{A}) = \mathbf{A}^{80}$  (cf)  $T(\mathbf{A}) = \mathbf{A}^{81}$  (cg)  $T(\mathbf{A}) = \mathbf{A}^{82}$  (ch)  $T(\mathbf{A}) = \mathbf{A}^{83}$  (ci)  $T(\mathbf{A}) = \mathbf{A}^{84}$  (cj)  $T(\mathbf{A}) = \mathbf{A}^{85}$  (ck)  $T(\mathbf{A}) = \mathbf{A}^{86}$  (cl)  $T(\mathbf{A}) = \mathbf{A}^{87}$  (cm)  $T(\mathbf{A}) = \mathbf{A}^{88}$  (cn)  $T(\mathbf{A}) = \mathbf{A}^{89}$  (co)  $T(\mathbf{A}) = \mathbf{A}^{90}$  (cp)  $T(\mathbf{A}) = \mathbf{A}^{91}$  (cq)  $T(\mathbf{A}) = \mathbf{A}^{92}$  (cr)  $T(\mathbf{A}) = \mathbf{A}^{93}$  (cs)  $T(\mathbf{A}) = \mathbf{A}^{94}$  (ct)  $T(\mathbf{A}) = \mathbf{A}^{95}$  (cu)  $T(\mathbf{A}) = \mathbf{A}^{96}$  (cv)  $T(\mathbf{A}) = \mathbf{A}^{97}$  (cw)  $T(\mathbf{A}) = \mathbf{A}^{98}$  (cx)  $T(\mathbf{A}) = \mathbf{A}^{99}$  (cy)  $T(\mathbf{A}) = \mathbf{A}^{100}$  (d)  $\begin{bmatrix} 1 & 2 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$  (e)  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$  (f)  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$  (g)  $\begin{bmatrix} 1 & -2 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{bmatrix}$  Classify the matrix as upper triangular, lower triangular, or diagonal, and decide by inspection whether the matrix is invertible. [Note: Recall that a diagonal matrix is both upper and lower triangular, so there may be more than one answer in some parts.] (a)  $\begin{bmatrix} 1 & 4 & 0 \\ 0 & 1 & 7 \end{bmatrix}$  (b)  $\begin{bmatrix} 0 & -3 \\ 0 & 0 \end{bmatrix}$  (c)  $\begin{bmatrix} 4 & 4 & 0 \\ 0 & 0 & \frac{3}{5} \\ 5 & 0 & -2 \end{bmatrix}$  (d)  $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 7 & 0 & 0 & 0 \end{bmatrix}$  Find the domain and codomain of the transformation  $T: \mathcal{A} \rightarrow \mathcal{A}$  where  $\mathcal{A}$  is the set of all  $4 \times 4$  matrices. (a)  $T(\mathbf{A}) = \mathbf{A}$