

Math 54 HW 2 selected solutions:

1.3: 12, 14, 18, 24

$$(18) \begin{bmatrix} 1 & -3 & | & h \\ 0 & 1 & | & -5 \\ -2 & 8 & | & -3 \end{bmatrix} \xrightarrow{R_3 := R_3 + 2R_1} \begin{bmatrix} 1 & -3 & | & h \\ 0 & 1 & | & -5 \\ 0 & 2 & | & 2h-3 \end{bmatrix} \xrightarrow{R_3 := R_3 - 2R_2} \begin{bmatrix} 1 & -3 & | & h \\ 0 & 1 & | & -5 \\ 0 & 0 & | & 2h+7 \end{bmatrix}$$

consistent iff $h = -\frac{7}{2}$.

- (24) (a) True
 (b) True
 (c) False, they can but that's considered trivial (not interesting).
 (d) True.
 (e) True.

1.4: 15, 16, 24, 32

- (24) (a) True
 (b) True
 (c) True
 (d) True
 (e) True (b/c the last row will amount to $0=c$ or something like that)
 (f) True

(32) No that would imply that ^{for} some 4×3 matrix A the system $Ax = b$ is consistent for all b in \mathbb{R}^4 , which means A has a pivot in every row.

But $A = \begin{bmatrix} * & * & * \\ * & * & * \\ * & * & * \\ * & * & * \end{bmatrix}$ can only have 3 pivots and there are 4 rows.

1.5: 6, 10, 16, 24

$$(6) \begin{bmatrix} 1 & 3 & -5 & | & 0 \\ 1 & 4 & -8 & | & 0 \\ -3 & -7 & 9 & | & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 4 & | & 0 \\ 0 & 1 & -3 & | & 0 \\ 0 & 0 & 0 & | & 0 \end{bmatrix} \quad \left\{ \begin{bmatrix} -4t \\ 3t \\ t \end{bmatrix} \right\} = \left\{ t \begin{bmatrix} -4 \\ 3 \\ 1 \end{bmatrix} \right\}$$

$$(16) \text{ Matrix } \sim \begin{bmatrix} 1 & 0 & 4 & | & -5 \\ 0 & 1 & -3 & | & 3 \\ 0 & 0 & 0 & | & 0 \end{bmatrix} \quad \left\{ \begin{bmatrix} -5-4t \\ 3+3t \\ t \end{bmatrix} \right\} = \left\{ \begin{bmatrix} -5 \\ 3 \\ 0 \end{bmatrix} + t \begin{bmatrix} -4 \\ 3 \\ 1 \end{bmatrix} \right\}$$

- (24) (a) False
(b) True
(c) True
(d) True
(e) True

1.7: 16, 18, 20, 22

- (16) dependent (scalar multiples of each other)
(18) dependent (more columns than rows)
(20) dependent (contains $\vec{0}$ vector)
(22) (a) True
(b) False — they could still be scalar mults of each other eg.
(c) True
(d) False