

pg. 199 # 2, 4, 8\*, 14, 16, 22\*, 42  
 pg. 205 # 2\*, 6, 8, 10, 11, 29

$$2. \begin{bmatrix} -3 & 7 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} -5 & 7 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} -3(-5) = 15 & -3(7) = -21 \\ +7(-2) = -14 & +7(3) = +21 \\ \hline & 0 \\ -2(-5) = 10 & -2(7) = -14 \\ +5(-2) = -10 & +5(3) = +15 \\ \hline & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

and

$$\begin{bmatrix} -5 & 7 \\ -2 & 3 \end{bmatrix} \begin{bmatrix} -3 & 7 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} -5(-3) = 15 & -5(7) = -35 \\ +7(-2) = -14 & +7(5) = +35 \\ \hline & 0 \\ -2(-3) = 6 & -2(7) = -14 \\ +3(-2) = -6 & +3(5) = +15 \\ \hline & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

both products yield the identity matrix, therefore the matrices are inverses.

$$4. \begin{bmatrix} 7 & 2 \\ 0 & -3 \end{bmatrix} = \begin{matrix} (7(-3)) - (0(2)) \\ -21 - 0 = -21 \end{matrix}$$

$$14. \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix} \begin{matrix} (2(0)) - (1(-1)) \\ 0 - (-1) = 1 \end{matrix} \text{ yes, inverse exists}$$

$$\frac{1}{1} \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$$

$$22. \begin{bmatrix} 12 & 7 \\ 5 & 3 \end{bmatrix} X = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$$

find determinant & inverse

$$(12 \cdot 3) - (5 \cdot 7)$$

$$36 - 35 = 1$$

$$\frac{1}{1} \begin{bmatrix} 3 & -7 \\ -5 & 12 \end{bmatrix} = \begin{bmatrix} 3 & -7 \\ -5 & 12 \end{bmatrix}$$

multiply both sides by inverse

$$X = \begin{bmatrix} 3 & -7 \\ -5 & 12 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 3(2) = 6 & 3(-1) = -3 \\ -7(3) = -21 & -7(2) = -14 \\ -15 & -17 \\ -5(2) = -10 & -5(-1) = 5 \\ 12(3) = 36 & 12(2) = 24 \\ 26 & 29 \end{bmatrix}$$

$$X = \begin{bmatrix} -15 & -17 \\ 26 & 29 \end{bmatrix}$$

$$42. \begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix} X + \begin{bmatrix} 2 & 7 \\ -3 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ -2 & 3 \end{bmatrix}$$

$$- \begin{bmatrix} 2 & 7 \\ -3 & 4 \end{bmatrix} \quad + \begin{bmatrix} -2 & -7 \\ 3 & -4 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix} X = \begin{bmatrix} 4 & -5 \\ 1 & -1 \end{bmatrix}$$

use GC, multiply both sides by inverse  $A^{-1}B$

$$X = \begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix}$$

$$2. \begin{bmatrix} 1 & 4 & 0 \\ 2 & 3 & 5 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 0 & 1 \end{bmatrix}$$

$$(0+0+0) - (0+5+0) \\ 0 - 5 = -5$$

6. use GC.  $\det = 6$

8. use GC. Do both products =  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ ?  $AB=I$   
 $BA=I$   
 yes.

They are inverses.

10. use GC. multiply by inverse of  $3 \times 3$  matrix on each side.

$$\begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix}$$

$$29. \begin{bmatrix} 7 & -5 & 3 \\ 0 & 1 & 3 \\ 8 & 4 & -2 \end{bmatrix} X + \begin{bmatrix} 5 \\ -9 \\ 0 \end{bmatrix} = \begin{bmatrix} 54 \\ -12 \\ 96 \end{bmatrix}$$

$$- \begin{bmatrix} 5 \\ -9 \\ 0 \end{bmatrix} + \begin{bmatrix} -5 \\ 9 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 7 & -5 & 3 \\ 0 & 1 & 3 \\ 8 & 4 & -2 \end{bmatrix} X = \begin{bmatrix} 49 \\ -3 \\ 96 \end{bmatrix}$$

use GC. Multiply both sides by  $3 \times 3$  inverse

$$X = \begin{bmatrix} 10 \\ 3 \\ -2 \end{bmatrix}$$

Answers for Lesson 4-5, pp. 199-201 Exercises

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

$$\begin{bmatrix} 3(3) + 2(-4) & 3(-2) + 2(3) \\ 4(3) + 3(-4) & 4(-2) + 3(3) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$2. \begin{bmatrix} -3 & 7 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} -5 & 7 \\ -2 & 3 \end{bmatrix} =$$

$$\begin{bmatrix} -3(-5) + 7(-2) & -3(7) + 7(3) \\ -2(-5) + 5(-2) & -2(7) + 5(3) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$3. \begin{bmatrix} \frac{1}{5} & -\frac{1}{10} \\ 0 & \frac{1}{4} \end{bmatrix} \begin{bmatrix} 5 & 2 \\ 0 & 4 \end{bmatrix} =$$

$$\begin{bmatrix} \frac{1}{5}(5) + (-\frac{1}{10})(0) & \frac{1}{5}(2) + (-\frac{1}{10})(4) \\ 0(5) + \frac{1}{4}(0) & 0(2) + \frac{1}{4}(4) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

4. -21

5. 0

6. -0.75

7.  $-\frac{11}{40}$

8. -17

9. 2

10. 11

11. 13

12. -3

13. -6

14. yes;  $\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$

15. yes;  $\begin{bmatrix} -1 & 3 \\ 1 & -2 \end{bmatrix}$

16. yes;  $\begin{bmatrix} 2 & -1.5 \\ -1 & 1 \end{bmatrix}$

17. yes;  $\begin{bmatrix} 0 & \frac{1}{2} \\ \frac{1}{3} & -\frac{1}{6} \end{bmatrix}$

42)  $\begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix}$

22)  $\begin{bmatrix} -15 & -17 \\ 26 & 29 \end{bmatrix}$

**Answers for Lesson 4-5, pp. 199–201 Exercises (cont.)**

18. no

19. yes;  $\begin{bmatrix} -\frac{1}{8} & -\frac{1}{2} \\ \frac{3}{16} & \frac{1}{4} \end{bmatrix}$

20. yes;  $\begin{bmatrix} \frac{2}{27} & \frac{4}{9} \\ \frac{10}{27} & \frac{2}{9} \end{bmatrix}$

21. yes;  $\begin{bmatrix} 0 & \frac{1}{3} \\ -\frac{1}{2} & \frac{1}{6} \end{bmatrix}$

22.  $\begin{bmatrix} +15 & -17 \\ 26 & 29 \end{bmatrix}$

23. No solutions; the determinant of  $\begin{bmatrix} 0 & -4 \\ 0 & -1 \end{bmatrix}$  is 0.

24.  $\begin{bmatrix} 10 \\ 15 \end{bmatrix}$

25. a. From

	No Cable	Cable
No Cable	$\begin{bmatrix} 0.98 & 0.005 \end{bmatrix}$	
Cable	$\begin{bmatrix} 0.02 & 0.995 \end{bmatrix}$	

b. about 20,100 people

c. about 19,897 people

26. 36

27. -120

28. 0

29. 2

30. 9

31. yes

32. No; answers may vary. Sample: The product is  $\begin{bmatrix} 23 & 8 \\ -46 & -16 \end{bmatrix}$ .

33. No; answers may vary. Sample: The product is  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ .

Answers for Lesson 4-6, pp. 205–207 Exercises

1. 20

2. -5

3. -14

4. 106

5. 1

6. 6

7. -7314.14

8. yes

9. no

10.  $\begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix}$

11.  $\begin{bmatrix} 5 \\ 8 \\ 2 \end{bmatrix}$

12. AUTUMN

13. PORTRAIT

14–16. For each matrix, the determinant equals zero.

17. a.  $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

b.  $\begin{bmatrix} 38 & 56 & 27 & 34 \\ 24 & 30 & 20 & 15 \\ 24 & 12 & 12 & 15 \end{bmatrix}$

c. Check students' work.

18. -30

19. -3

20. 25

21. 1

22.  $\begin{bmatrix} -4 & -3.5 & 2 \\ -5 & -5 & 3 \\ 2 & 2 & -1 \end{bmatrix}$

23.  $\begin{bmatrix} 0.4 & 0.4 & 0.2 \\ -0.6 & -0.6 & 0.2 \\ -0.2 & 0.8 & 0.4 \end{bmatrix}$

24.  $\begin{bmatrix} 0 & \frac{1}{7} & \frac{2}{7} \\ \frac{1}{4} & \frac{3}{14} & -\frac{1}{14} \\ \frac{1}{2} & 0 & 0 \end{bmatrix}$

25. no inverse

29)  $\begin{bmatrix} 10 \\ 3 \\ -2 \end{bmatrix}$

13

26. a. 0  
 b. 0  
 c. 0  
 d. 0

Answers may vary. Sample: When the top row and bottom row are identical and the middle row has the same numbers as both rows, then the determinant is zero.

27. MORNING GRACE

28. THE CHAMBERED NAUTILUS

29.  $\begin{bmatrix} 10 \\ 3 \\ -2 \end{bmatrix}$

30.  $\begin{bmatrix} -1 & 2 & 6 \\ 0 & 0 & 5 \\ 8 & -1 & 0 \end{bmatrix}$

31. C

32. C

33. A

34. yes;  $\begin{bmatrix} -\frac{5}{69} & \frac{2}{23} \\ \frac{8}{69} & \frac{6}{23} \end{bmatrix}$

35. no

36. yes;  $\begin{bmatrix} -\frac{5}{33} & \frac{2}{33} \\ \frac{3}{22} & \frac{1}{22} \end{bmatrix}$

37. yes;  $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

38.  $(\frac{9}{4}, \frac{11}{4})$

39.  $(-\frac{13}{8}, \frac{69}{16}, -\frac{15}{16})$