Day 37

4.5 + 4.6 2×2 & 3×3 Determinants

$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $a \cdot d - b \cdot c$

↗ det A
calculator

$\begin{vmatrix} a & b \\ c & d \end{vmatrix}$

↖ ↗ bars also a symbol for determinant

ex1 $\begin{vmatrix} 4 & 2 \\ 4 & 2 \end{vmatrix} = 4 \cdot 2 - 4 \cdot 2 = 8 - 8 = 0$

ex2 $\begin{vmatrix} 8 & 7 \\ 2 & 3 \end{vmatrix} = 8 \cdot 3 - 2 \cdot 7 = 24 - 14 = 10$

ex3 $\begin{vmatrix} K & 3 \\ 3-K & -3 \end{vmatrix} = K(-3) - 3(3-K)$

$= -3K - 9 + 3K$

$= -9$

ex4 $\begin{vmatrix} 5\sqrt{3} & 9 \\ -7 & 2\sqrt{3} \end{vmatrix} = (5\sqrt{3})(2\sqrt{3}) - (-7)(9)$

$10\sqrt{9}$

$10 \cdot 3$

$30 + 63$

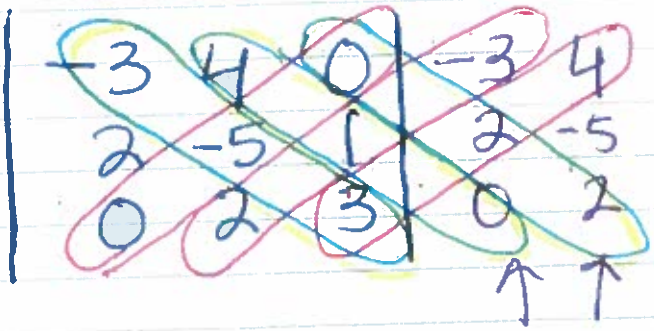
$= 93$

ex $\begin{vmatrix} \frac{2}{5} & \frac{1}{3} \\ \frac{1}{4} & \frac{1}{2} \end{vmatrix} = \frac{2}{5}\cdot\frac{1}{2} - \frac{1}{4}\cdot\frac{1}{3}$

$\frac{1}{5} - \frac{1}{12}$

3x3 Matrices

By Hand : Diagonals Method



* 1st copy the 1st 2 columns to the right outside

2nd step: multiply the diagonals starting on top left and ADD

$-3(-5)(3) + (4)(1)(0) + (0)(2)(2) - 0(-5)(0) - 2(1)(-3) - 3(2)(4)$

$45 + 0 + 0 - 0 + 6 - 24$

$= 27$

3rd step: multiply the diagonals starting from the bottom left and subtract 4th: combine #'s

ex $\begin{vmatrix} 1 & -1 & 2 \\ 0 & 4 & 2 \\ 3 & -6 & 10 \end{vmatrix}$ $\begin{matrix} 1 & -1 \\ 0 & 4 \\ 3 & 6 \end{matrix}$

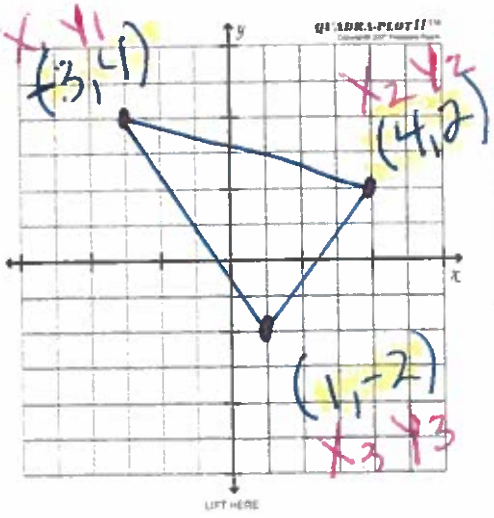
$= 40 + 6 + 0 - 24 + 12 - 0$

$= 22$

$1(4)(10) + -1(2)(3) + 2(0)(6) - 3(4)(2) - (-6)(2)(1) - 10(0)(-1)$

Area of a triangle in the Coordinate Plane

$$\text{Area} = \pm\frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$



$$\text{Area} = \pm\frac{1}{2}\begin{vmatrix} -3 & 4 & 1 \\ 4 & 2 & 1 \\ 1 & -2 & 1 \end{vmatrix}$$

$$= -\frac{1}{2}(-34)$$

determinant

$$= 17 \text{ sq. units}$$

Name _____ 4.5 wks + ____

☆ Show work for the "☆" problems

Find the value of each determinant.

☆ 1. $\begin{vmatrix} 2 & 3 \\ -2 & 5 \end{vmatrix}$

☆ 2. $\begin{vmatrix} 6 & -1 \\ 4 & 8 \end{vmatrix}$

3. $\begin{vmatrix} -3 & -2 \\ 5 & 3 \end{vmatrix}$

4. $\begin{vmatrix} -8 & 6 \\ 4 & -2 \end{vmatrix}$

☆ 5. $\begin{vmatrix} -10 & 3 \\ -4 & 5 \end{vmatrix}$

☆ 6. $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

7. $\begin{vmatrix} -3 & 5 \\ -9 & -2 \end{vmatrix}$

8. $\begin{vmatrix} -2 & 0 \\ 4 & 2 \end{vmatrix}$

☆ 9. $\begin{vmatrix} 3\sqrt{2} & 5 \\ -2 & 2\sqrt{2} \end{vmatrix}$

10. $\begin{vmatrix} 0 & 7 \\ 0 & 9 \end{vmatrix}$

☆ 11. $\begin{vmatrix} \frac{1}{4} & \frac{5}{6} \\ \frac{1}{2} & \frac{2}{3} \end{vmatrix}$

12. $\begin{vmatrix} \frac{1}{3} & \frac{1}{6} \\ -\frac{1}{5} & \frac{3}{10} \end{vmatrix}$

☆ 13. $\begin{vmatrix} m+n & 3 \\ m-n & 5 \end{vmatrix}$

☆ 14. $\begin{vmatrix} c-d & c+d \\ 3 & 4 \end{vmatrix}$

☆ 15. $\begin{vmatrix} -r & p+r \\ 6 & 10 \end{vmatrix}$

4.6 **Find the value of each determinant.**

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

2. $\begin{vmatrix} -3 & 2 & -5 \\ 4 & -1 & 2 \\ -1 & -2 & -3 \end{vmatrix}$

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

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

5. $\begin{vmatrix} 2 & 3 & 5 \\ 4 & 2 & 1 \\ -1 & -3 & 2 \end{vmatrix}$

☆ 6. $\begin{vmatrix} -3 & 1 & 5 \\ -2 & 0 & 2 \\ 6 & 3 & 4 \end{vmatrix}$

7. $\begin{vmatrix} 1 & 3 & -2 \\ 1 & -4 & 5 \\ 1 & 2 & 3 \end{vmatrix}$

☆ 8. $\begin{vmatrix} 1 & -1 & 4 \\ 0 & 1 & -7 \\ 0 & 0 & 1 \end{vmatrix}$

Use your graphing calculator for each section.

4.5

In 1–4, evaluate the determinant of the 2 × 2 matrix.

1. $\begin{bmatrix} 6 & 2 \\ -1 & 3 \end{bmatrix}$
2. $\begin{bmatrix} -1 & 5 \\ 3 & 4 \end{bmatrix}$
3. $\begin{bmatrix} -4 & 6 \\ -2 & 3 \end{bmatrix}$
4. $\begin{bmatrix} 0 & -1 \\ 7 & 8 \end{bmatrix}$

4.6

In 11–13, evaluate the determinant of the 3 × 3 matrix.

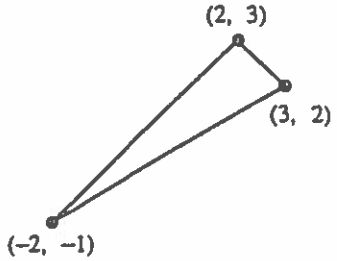
11. $\begin{bmatrix} 4 & 3 & -1 \\ -2 & 1 & 0 \\ 5 & 6 & -3 \end{bmatrix}$

13. $\begin{bmatrix} -1 & 2 & 0 \\ 5 & 1 & 6 \\ 0 & 3 & -5 \end{bmatrix}$

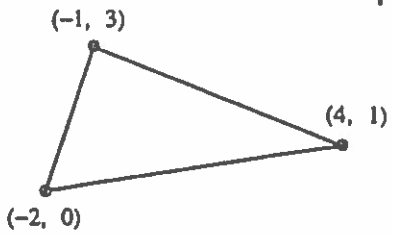
4.6

In 14–16, use a determinant to find the area of the triangle. Show your work. Use your graphing calculator to find the determinant of each 3×3 matrix

14.



15.



$\pm \frac{1}{2}$ | | |

answer =