Ch.9/10 Test: tomorrow!

- No notes.
- Ok to use a calculator.

- Some problems will be faster and easier without a calculator.

- Use study list as a guide for memorizing necessary formulas.

Study list for ch.9/10 test (vectors and matrices)

Ok to use a calculator.

No notes.

<u>CHAPTER 9</u>

Be able to calculate the following for 2- and 3-dimensional vectors:

- component form given two endpoints
- magnitude and direction *(sketch diagram)*
- angle between 2 vectors
- sum of unit vectors
- add, subtract, & multiply by scalars
- simplify equations
- dot product *(vectors are perpendicular if = 0)*
- cross product *(creates a 3rd vector that is perp)*

Also, know the <u>Law of Cosines</u> and <u>Law of Sines</u> so you can solve for the <u>magnitude</u> and <u>direction</u> of a **resultant vector** from a given diagram.

<u>CHAPTER 10</u>

Be able to perform matrix operations by hand and/or with a calculator when appropriate:

- add, subtract, multiply, scalars
- determinant *(if = 0, inverse does not exist) DNE*
  (if ≠ 0, then there is an inverse)
- inverse
- solve system of equations by writing a matrix equation, then applying the inverse

$$\underbrace{\begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}}_{A}\begin{bmatrix}x\\y\\z\end{bmatrix}=\underbrace{\begin{bmatrix} \\ \\ \\ \end{bmatrix}}_{B} \rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix}=\underbrace{\begin{bmatrix} \\ \\ \\ \end{bmatrix}}_{A^{-1}B}$$

CHECK ANSWERS#1-9 for review sheet

1. **D**
2. **A**
3. **A**
4. **B**
5. **B**
6. **D**
7. **C**
8. **A**
9. **D**

See following slides for a summary of formulas your need to know for the ch.9 and ch.10 test.

Vector representation (component form):

$$v = \langle x_2 - x_1,\ y_2 - y_1 \rangle$$

NOTES 9.1

Magnitude: $|v| = \sqrt{x^2 + y^2}$

horizontal vertical

components

The sum of unit vectors in 2 dimensions: $\langle -2, 3 \rangle = -2\vec{i} + 3\vec{j}$

NOTES 9.2

DEFINITION OF THE DOT PRODUCT

If $\mathbf{u} = \langle a_1, a_2 \rangle$ and $\mathbf{v} = \langle b_1, b_2 \rangle$ are vectors, then their **dot product**, denoted by $\mathbf{u} \cdot \mathbf{v}$, is defined by

multiply like components

$$\mathbf{u} \cdot \mathbf{v} = a_1 b_1 + a_2 b_2$$

The dot product is not a vector; it is a real number, or scalar (comparison of slopes.)

If u•v = 0, then vector u and v are perpendicular.

NOTES 9.2

ANGLE BETWEEN TWO VECTORS

If θ is the angle between two nonzero vectors **u** and **v**, then

$$\cos\theta = \frac{\mathbf{u}\cdot\mathbf{v}}{|\mathbf{u}||\mathbf{v}|}$$

← dot product

Magnitude →

← Magnitude

NOTES: 9.5

The **cross product** finds a vector that is perpendicular (orthogonal) to 2 given vectors that are in the same plane.

a x b = cross product

↑ ***Not a multiplication symbol. A matrix will be used to calculate the cross product.***

NOTES 9.5

Given:

$$\vec{a} = \langle -2, -3, 1 \rangle$$

$\vec{i}$ $\vec{j}$ $\vec{k}$

$$\vec{b} = \langle 2, 5, -4 \rangle$$

1st step: set up a 3 by 3 determinant

$$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -2 & -3 & 1 \\ 2 & 5 & -4 \end{vmatrix}$$

2nd step: evaluate using 2 by 2 *minor* determinants

$$\vec{i}\begin{vmatrix} -3 & 1 \\ 5 & -4 \end{vmatrix} - \vec{j}\begin{vmatrix} -2 & 1 \\ 2 & -4 \end{vmatrix} + \vec{k}\begin{vmatrix} -2 & -3 \\ 2 & 5 \end{vmatrix}$$

See notes 10.6 for more details about determinants!!

2nd step: evaluate using 2 by 2 minor determinants

$$\vec{i}\begin{vmatrix} -3 & 1 \\ 5 & -4 \end{vmatrix} - \vec{j}\begin{vmatrix} -2 & 1 \\ 2 & -4 \end{vmatrix} + \vec{k}\begin{vmatrix} -2 & -3 \\ 2 & 5 \end{vmatrix}$$

$$(12-5)i - (8-2)j + (-10+6)k$$

$$7i - 6j - 4k = \langle 7, -6, -4 \rangle$$

NOTES 10.5-10.6

$$\det\begin{bmatrix} a & b \\ c & d \end{bmatrix} \text{ is written as } \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

These straight line→ symbols indicate determinant

If $\mathbf{A} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then

modified matrix

$$\mathbf{A}^{-1} = \frac{1}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Determinant→

To clear **matrices**:

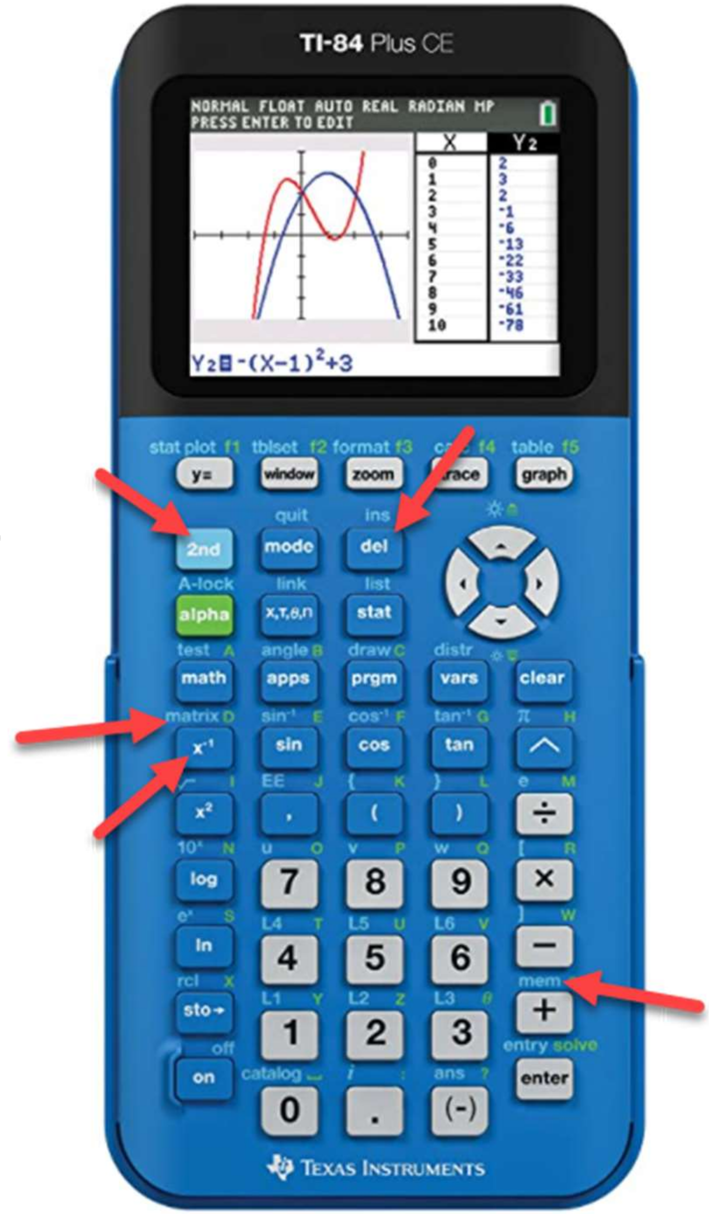
addition

2nd MEM (above + symbol)

2: Mem Mgmt / Del

5: Matrix

push delete to clear the matrix next to the arrow ►



To convert **decimals to fractions**:

MATH (far left column)

<enter>

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$$\begin{bmatrix} \frac{2}{7} & \frac{-3}{7} \\ 6 & \frac{5}{14} \end{bmatrix}$$

Use **ANS** to bring down values from previous calculations

(bottom row, above negative sign)