Concept Review

Vectors and Parametrics (6.1, 6.3)

Problem 1

- Find the component form of the vector AB with A(3, -4) and B(10, -7).

- Answer -

$$= \langle 10, -7 \rangle - \langle 3, -4 \rangle$$
$$= \langle 10 - 3, -7 - -4 \rangle$$
$$= \langle 7, -3 \rangle$$

Problem 2

- For vector AB where A(3, -4) and B(10, -7), find the magnitude of the vector.

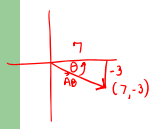
- Answer:

$$|AB| = \sqrt{7^2 + (-3)^2}$$
$$|AB| = \sqrt{49 + 9}$$
$$|AB| = \sqrt{58}$$

Problem 3

- For vector AB with A(3, -4) and B(10, -7), find the direction angle of the vector.

- ANSWER:



$$\theta = \tan^{-1}\left(\frac{-3}{7}\right)$$

$$\theta = -23.2°$$

Problem 4

- Given u = $\langle 2,-1\rangle$ and v = $\langle 4,6\rangle$, find 3u + 4v.

Problem 4

- ANSWER:

$$= 3\langle 2,-1\rangle + 4\langle 4,6\rangle$$
$$= \langle 6,-3\rangle + \langle 16,24\rangle$$
$$= \langle 6+16,-3+24\rangle$$
$$= \langle 22,21\rangle$$

Problem 5

- Given the parametric equations:

$$x = 3t - 4$$
$$y = t + 2$$

Eliminate the parameter.

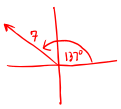
ANSWER:

- X=3T-4 and Y=T+2
- Solve for T in the y-equation to get T=Y-2
- Substitute into X X=3(Y-2)-4
- X=3Y-6-4
- X=3Y-10
- ANSWER IS $y = \frac{1}{3}x + \frac{10}{3}$

Problem 6

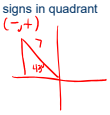
- If a vector has a magnitude of 7 and a direction angle of 137 degrees, find the component form of the vector (round to hundredths).

Problem 6



- ANSWER
  - 1st step: Determine which quadrant the vector is in and find it's reference angle.
  - 2nd Step: Calculate the horizontal and vertical component of the vector using the reference angle
  - 3rd Step; BE SURE that you check for the correct signs depending on which quadrant you are located in
  - Answer: Since vector is in quadrant II, reference angle is 180 °– 137° = 43°
  - Be sure to make the horizontal component negative since the signs in quadrant II are (- , +)

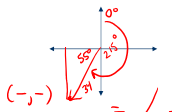
$$= \langle -7\cos 43°, 7\sin 43° \rangle$$
$$= \langle -5.12, 4.77 \rangle$$



Problem 7

- If a ship is sailing on a bearing of 215 degrees and at a speed of 34 miles per hour, find the component form of the velocity vector.

Problem 7



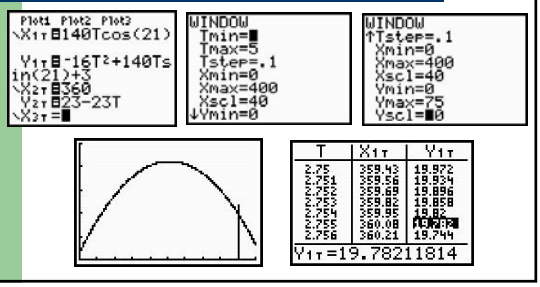
$270° - 215°$
$= 55°$

$= \langle -34\cos 55°, -34\sin 55° \rangle$
$= \langle -19.50, -27.85 \rangle$

Problem 8

- A baseball is hit from a height of 3 feet off the ground with an initial velocity of 140 feet per second and at an angle of 21 degrees with the ground. Assuming there is no wind, will the ball clear a fence that is 23 feet high and is 360 feet away? Explain why or why not using actual data.

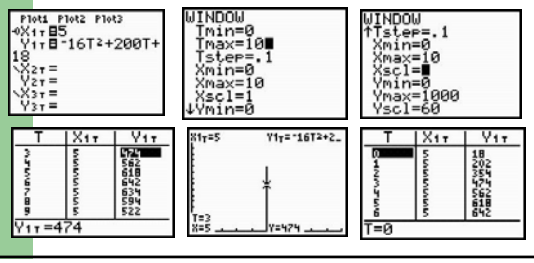
- It does not clear the 23 foot wall. It is approximately 19.78 feet off of the ground when it reaches the wall. See below.



Problem 9

- A rocket is shot straight up at a height of 18 feet above the ground with an initial velocity of 200 feet per second. Write a parametric equation for the situation and give the height of the rocket after 3 seconds. Is it on it's way up or down at 3 seconds?

ANSWER: It was 474 ft above the ground on it's way up. See table below.



Problem 10

- Find the parameterization of a line segment with endpoints at (1, -2) and (-2, 4).

ANSWER

$$X_T = 1 - 3T$$
$$Y_T = -2 + 6T$$
$$T : [0, 1]$$

Problem 11

- Find the parameterization of a circle with radius 6 and center at (1, 2).

$$X_T = 1 + 6\cos T$$
$$Y_T = 2 + 6\sin T$$
$$T : [0°, 360°]$$