Review 6.1, 6.3 Homework Name DiMarco

Let u = <2, -1>, v = <4, 2>, and w = <1, -3>. Find:

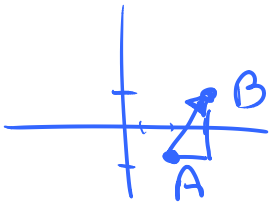
1. 2u + v + 3w

$2\langle 2,-1\rangle + \langle 4,2\rangle + 3\langle 1,-3\rangle$

$\langle 4,-2\rangle + \langle 4,2\rangle + \langle 3,-9\rangle$

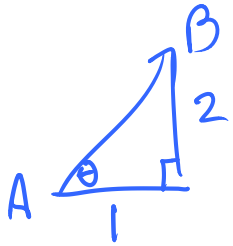
$\boxed{\langle 11,-9\rangle}$

2. Find the component form of a vector $\overrightarrow{AB}$ with A = (2, -1) and B = (3, 1).



$\overrightarrow{AB} = \langle 1, 2\rangle$

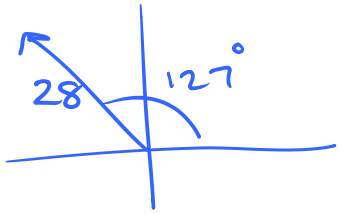
3. Find the magnitude and direction angle of the vector in #2.



$\text{mag} = |AB| = \sqrt{1^2 + 2^2} = \sqrt{5}$

$\theta = \tan^{-1}\left(\frac{2}{1}\right) = 63.435^\circ$

4. Find the component form of a vector with a direction angle of 127 degrees and magnitude of 28.

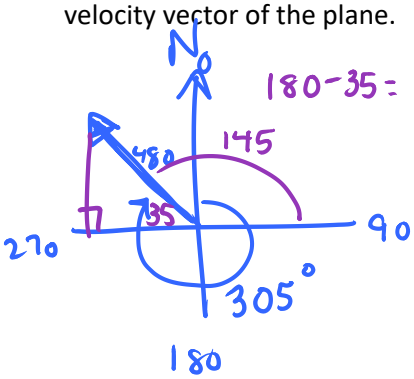


$\langle 28\cos 127^\circ, 28\sin 127^\circ\rangle$

$\langle -16.851, 22.362\rangle$

5. An airplane flies at a bearing of 305 degrees and at a speed of 480 miles per hour. Find the components of the velocity vector of the plane.

$\boxed{450^\circ - \text{Bearing}} = 450^\circ - 305^\circ = 145^\circ$



$\langle 480\cos 145^\circ, 480\sin 145^\circ\rangle$

$\langle -393.193, 275.317\rangle$

393 mph West and 275 mph North

For 6-7, graph and eliminate the parameter.

6. x = 1 - 2t, y = 3 + 4t

$X = 1 - 2T$

$X - 1 = -2T$

$T = \frac{x-1}{-2} = -\frac{1}{2}x + \frac{1}{2}$

$Y = 3 + 4T$

$Y = 3 + 4\left(-\frac{1}{2}x + \frac{1}{2}\right)$

$Y = 3 - 2x + 2$

$\boxed{Y = -2x + 5 \quad \text{Line or seg}}$

7. x = 6cost, y = 6sint

$\boxed{X^2 + Y^2 = 36}$

Circle

center $= (0,0)$

$r = 6$

For 8-10, find a parameterization for the curve.

8. The line through points (-2, 5) and (3, 1).

$X = -2 + 5T$

$Y = 5 - 4T$

$T: (-\infty, \infty)$

9. For #8, what would be the parameterization for a line segment with the same endpoints?

just change $T: [0, 1]$

10. A circle with radius of 6 and center at (4, 5).

$X = 4 + 6\cos T$

$Y = 5 + 6\sin T$

$T: [0, 360^\circ]$

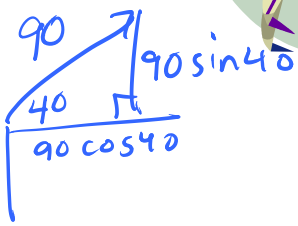
or $T: [0, 2\pi]$

11. Jason is playing catch with his brother. Jason throws the ball at a height of 6 feet with an initial velocity of 90 feet per second and at an angle of 40 degrees with the horizontal.

a) Write the parametric equations for the position of the ball in terms of time.

$X = 90\cos(40)T$

$Y = -16T^2 + 90\sin(40)T + 6$



b) What is the maximum height the ball will reach?

function $y = -16x^2 + 90\sin(40)x + 6$ (or use Table!)

max 58.29 ft at $t = 1.81$ sec

c) At what time will the ball hit the ground? How far did Jason throw it?

zero $t = 3.72$ sec

$X = 90\cos(40)(3.72)$

$X = 256.24$ ft

d) If Jason's brother is 240 feet away and can catch a ball anywhere between 1 and 7 feet above the ground, will his brother catch the ball? Give a reason why or why not.

$X = 240 = 90\cos(40)T$

at $T = 3.48$ sec

y at $T = 3.48$ sec $= 13.50$ ft

No - too high

12. The Red Cross is dropping supplies from an airplane. The drop was made from an altitude of 1000 feet above the ground.

a) Find the parametric equations to model the height of the containers as a function of time in seconds.

$X = 5$ (arbitrary)

$Y = -16T^2 + 1000$

b) After 4 seconds of free fall, the parachutes open. How many feet above the ground are the food containers when the parachutes open?

$T = 4$

$Y = -16(4)^2 + 1000 = 744$ ft

(or trace in parametric mode)

c) The minimum height that the parachutes can open without damaging the supplies during the fall is 200 feet above the ground. What's the maximum amount of time that the supplies can fall before the parachutes open so that the supplies are not damaged?

$Y = 200 = -16T^2 + 1000$

$T = 7.071$ sec

13. Sarah is running a race. Suppose she is running at a constant rate of 15 feet per second.

a) Write the parametric equations to model ~~his~~ her distance traveled in terms of time in seconds.

$X_1 = 15T$

$Y_1 = 2$

b) 5 seconds after Sarah started running, Melanie starts running at a speed of 18 feet per second. If the race is 200 feet long, who will win the race? Explain your reasoning.

$X_2 = 18(T-5)$

$Y_2 = 4$

See Parametrically or, $15T = 200$

$T = 13.33$ sec Sarah

$18(T-5) = 200$

$T = 16.11$ sec Melanie

Sarah wins race. She runs it in 13.3 sec, while Melanie takes 16.1 sec.