

**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:

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

$$|AB| = \sqrt{49 + 9}$$

$$|AB| = \sqrt{58}$$

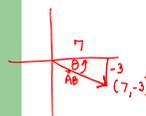
**Problem 3**

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

- ANSWER:

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

$$\theta = -23.2^\circ$$



**Problem 4**

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

• ANSWER:

$$\begin{aligned} &= 3\langle 2, -1 \rangle + 4\langle 4, 6 \rangle \\ &= \langle 6, -3 \rangle + \langle 16, 24 \rangle \\ &= \langle 6+16, -3+24 \rangle \\ &= \langle 22, 21 \rangle \end{aligned}$$

**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  $y = \frac{1}{3}x + \frac{10}{3}$

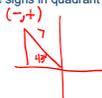
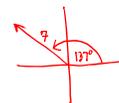
**Problem 6**

- 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).

• ANSWER

- 1<sup>st</sup> step: Determine which quadrant the vector is in and find its reference angle.
- 2<sup>nd</sup> Step: Calculate the horizontal and vertical component of the vector using the reference angle
- 3<sup>rd</sup> 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  $180^\circ - 137^\circ = 43^\circ$
- Be sure to make the horizontal component negative since the signs in quadrant II are (-, +)

$$\begin{aligned} &= \langle -7 \cos 43^\circ, 7 \sin 43^\circ \rangle \\ &= \langle -5.12, 4.77 \rangle \end{aligned}$$



### 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.

$270^\circ - 215^\circ = 55^\circ$   
 $= \langle -34 \cos 55^\circ, -34 \sin 55^\circ \rangle$   
 $= \langle -19.50, -27.05 \rangle$

### 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.

Plot1 Plot2 Plot3 X1T=140Tcos(21) Y1T=-16T^2+140Ts In(21)+3 X2T=360 Y2T=23-23T X3T=	WINDOW Tmin=0 Tmax=5 Tstep=.1 Xmin=0 Xmax=400 Xscl=40 Ymin=0 Ymax=75 Yscl=10	WINDOW Tstep=.1 Xmin=0 Xmax=400 Xscl=40 Ymin=0 Ymax=75 Yscl=10
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T	X1T	Y1T
0	0	3
1	132.5	10.72
2	265	18.54
3	397.5	19.86
4	530	15.68
5	662.5	6.00
6	795	-10.18
7	927.5	-32.32
8	1060	-50.44
9	1192.5	-64.54
10	1325	-74.62
11	1457.5	-80.68
12	1590	-82.72
13	1722.5	-80.74
14	1855	-74.74
15	1987.5	-64.72
16	2120	-50.68
17	2252.5	-32.62
18	2385	-10.54
19	2517.5	7.54
20	2650	25.68
21	2782.5	43.86
22	2915	62.08
23	3047.5	80.32
24	3180	98.58
25	3312.5	116.86
26	3445	135.16
27	3577.5	153.48
28	3710	171.82
29	3842.5	190.18
30	3975	208.56
31	4107.5	226.96
32	4240	245.38
33	4372.5	263.82
34	4505	282.28
35	4637.5	300.76
36	4770	319.26
37	4902.5	337.78
38	5035	356.32
39	5167.5	374.88
40	5300	393.46
41	5432.5	412.06
42	5565	430.68
43	5697.5	449.32
44	5830	467.98
45	5962.5	486.66
46	6095	505.36
47	6227.5	524.08
48	6360	542.82
49	6492.5	561.58
50	6625	580.36
51	6757.5	599.16
52	6890	617.98
53	7022.5	636.82
54	7155	655.68
55	7287.5	674.56
56	7420	693.46
57	7552.5	712.38
58	7685	731.32
59	7817.5	750.28
60	7950	769.26
61	8082.5	788.26
62	8215	807.28
63	8347.5	826.32
64	8480	845.38
65	8612.5	864.46
66	8745	883.56
67	8877.5	902.68
68	9010	921.82
69	9142.5	940.98
70	9275	960.16
71	9407.5	979.36
72	9540	998.58
73	9672.5	1017.82
74	9805	1037.08
75	9937.5	1056.36
76	10070	1075.66
77	10202.5	1094.98
78	10335	1114.32
79	10467.5	1133.68
80	10600	1153.06
81	10732.5	1172.46
82	10865	1191.88
83	10997.5	1211.32
84	11130	1230.78
85	11262.5	1250.26
86	11395	1269.76
87	11527.5	1289.28
88	11660	1308.82
89	11792.5	1328.38
90	11925	1347.96
91	12057.5	1367.56
92	12190	1387.18
93	12322.5	1406.82
94	12455	1426.48
95	12587.5	1446.16
96	12720	1465.86
97	12852.5	1485.58
98	12985	1505.32
99	13117.5	1525.08
100	13250	1544.86

### 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.**

Plot1 Plot2 Plot3 X1T=18 Y1T=-16T^2+200T+18 X2T= Y2T= X3T= Y3T=	WINDOW Tmin=0 Tmax=10 Tstep=.1 Xmin=0 Xmax=10 Xscl=1 Ymin=0 Ymax=1000 Yscl=60	WINDOW Tstep=.1 Xmin=0 Xmax=10 Xscl=1 Ymin=0 Ymax=1000 Yscl=60
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T	X1T	Y1T
0	18	18
1	18	182
2	18	618
3	18	1142
4	18	1654
5	18	2152
6	18	2636
7	18	3106
8	18	3562
9	18	4004
10	18	4432
11	18	4846
12	18	5246
13	18	5632
14	18	6004
15	18	6362
16	18	6706
17	18	7036
18	18	7352
19	18	7654
20	18	7942
21	18	8216
22	18	8476
23	18	8722
24	18	8954
25	18	9172
26	18	9376
27	18	9566
28	18	9742
29	18	9904
30	18	10052
31	18	10186
32	18	10306
33	18	10412
34	18	10504
35	18	10582
36	18	10646
37	18	10696
38	18	10732
39	18	10754
40	18	10762
41	18	10756
42	18	10736
43	18	10702
44	18	10654
45	18	10592
46	18	10516
47	18	10426
48	18	10322
49	18	10204
50	18	10072
51	18	9926
52	18	9766
53	18	9592
54	18	9404
55	18	9202
56	18	8986
57	18	8756
58	18	8512
59	18	8254
60	18	7982
61	18	7696
62	18	7396
63	18	7082
64	18	6754
65	18	6412
66	18	6056
67	18	5686
68	18	5302
69	18	4904
70	18	4492
71	18	4066
72	18	3626
73	18	3172
74	18	2704
75	18	2222
76	18	1726
77	18	1216
78	18	692
79	18	154
80	18	-166
81	18	-322
82	18	-474
83	18	-622
84	18	-766
85	18	-906
86	18	-1042
87	18	-1174
88	18	-1302
89	18	-1426
90	18	-1546
91	18	-1662
92	18	-1774
93	18	-1882
94	18	-1986
95	18	-2086
96	18	-2182
97	18	-2274
98	18	-2362
99	18	-2446
100	18	-2526

**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).

$$X_T = 1 + 6 \cos T$$

$$Y_T = 2 + 6 \sin T$$

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