Rachel Balji
September 7, 2020

Triangle inequality: $\|v+w\| \leq \|v\| + \|w\|$
$v = ai + bj$

*To find the unit vector u of the vector $v = \langle x, y \rangle$, you ~~do~~ divide that vector by its magnitude:
$u = \frac{v}{|v|}$ where $|v| = \sqrt{x^2+y^2}$

12.1 : 5, 7, 9, 11, 15, 21, 41, 47

12.2 : 11, 13, 19, 25, 27, 31, 49, 51

12.1

5.
a. True (v and $-2v$ are parallel)
b. False (the vectors v and $-2v$ do not point in the same direction)

5.
$(u, 45°) \rightarrow \langle \frac{\sqrt{2}}{2}\|u\|, \frac{\sqrt{2}}{2}\|u\| \rangle$

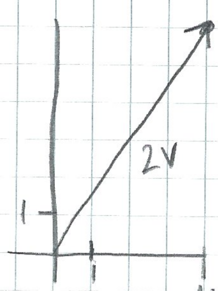
7.
$\langle \cos(-20)\|w\|, \sin(-20)\|w\| \rangle$
↳ $(x,y) \rightarrow (\cos x, \sin x)$

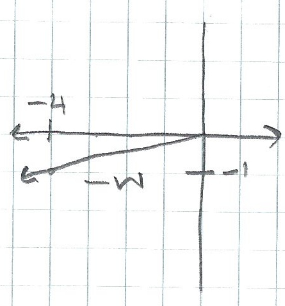
9.
$P = (3,2)$
$Q = (2,7)$
$\rightarrow \overrightarrow{PQ} = \langle -1, 5 \rangle$
$(Q[1]-P[1], Q[2]-P[2])$

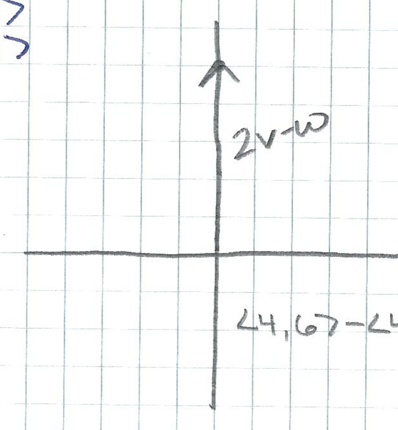
11.
$\overrightarrow{PQ} = \langle -2, -9 \rangle$

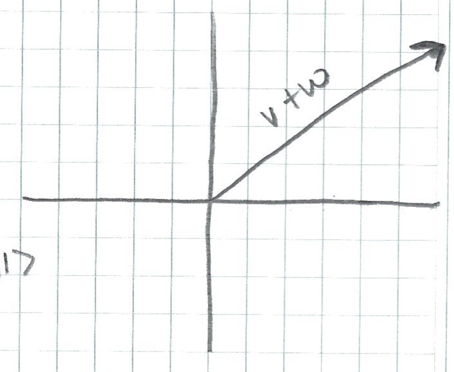
15.
$5\langle 6,2 \rangle = \langle 30, 10 \rangle$

21.
sketch $2v$, $v+w$, $-w$, $2v-w$
where $v = \langle 2,3 \rangle$, $w = \langle 4,1 \rangle$
length, height









↳ do we always need to draw the original vector?

41.
Unit vector e_v where
$v = \langle 3,4 \rangle$
↳ $|v| = \sqrt{9+16} = 5$
↳ $\langle \frac{3}{5}, \frac{4}{5} \rangle$

47. "Unit vector e making an angle of $\frac{4\pi}{7}$ with the x-axis."
↳ $(e, \frac{4\pi}{7})$
↳ $e = \langle \cos\frac{4\pi}{7}, \sin\frac{4\pi}{7} \rangle$

unit vector so you do not multiply any values to the angles since the unit vector has a value of 1. ($v = ai + bj$ or $v = \langle a, b \rangle$).

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Equations for the line through $P_0 = (x_0, y_0, z_0)$ with direction vector $v = \langle a, b, c \rangle$

Vector parametrization: $r(t) = \vec{OP_0} + tv$
$= \langle x_0, y_0, z_0 \rangle + t\langle a, b, c \rangle$

Parametric equations:
$x = x_0 + at$
$y = y_0 + bt$ $z = z_0 + ct$

12.2: 11, 13, 19, 25, 27, 31, 49, 51

* Parallel: $A = kB$

Perpendicular: $AB = 0$

11.

How do you sketch?

$w = \vec{PR}$ $\langle 3, -2, 3 \rangle$
where $R = (1, 4, 3)$

$\vec{PR} = \langle 1 - x = 3, 4 - x = -2, 3 - x = 3 \rangle$
$P = (-2, 6, 0)$

13. * which vectors are parallel and point in the same direction
$v = \langle 4, 8, 12 \rangle$

a. $\langle 2, 4, 6 \rangle \to$ Parallel and same direction

* b. $\langle -1, -2, 3 \rangle \to$ Not parallel

c. $\langle -7, -14, -21 \rangle \to$ Parallel and Opposite directions

d. $\langle 6, 10, 14 \rangle \to$ Not parallel

19.
$-2\langle 8, 11, 3 \rangle + 4\langle 2, 1, 1 \rangle$

$= \langle -16, -22, -6 \rangle + \langle 8, 4, 4 \rangle$

$= \langle -8, -18, -2 \rangle$

25.

$u = \langle 4, 2, -6 \rangle$
$v = \langle 2, -1, 3 \rangle$ $\to$ not parallel

27.

$u = \langle -3, 1, 4 \rangle$
$v = \langle 6, -2, 8 \rangle$ $\to$ Not parallel

31.
$v = \langle -4, 4, 2 \rangle$

$|v| = \sqrt{16 + 16 + 4} = \sqrt{36} = 6$

$-e_v = \langle \frac{4}{6}, \frac{-4}{6}, \frac{-2}{6} \rangle$

$\underbrace{-e_v = \langle \frac{2}{3}, \frac{-2}{3}, \frac{-1}{3} \rangle}_{\text{unit vector in the opposite direction}}$

49.
$P = (5, 5, 2)$
$V = \langle 0, -2, 1 \rangle$

same (just parallel)
$r(t) = \langle 5, 5, 2 \rangle + t\langle 0, -2, 1 \rangle$
$r_2(t) = \langle 5, 5, 2 \rangle + t\langle 0, -20, 10 \rangle$

51. ?

show that they do not intersect
$r_1(t) = \langle -1, 2, 2 \rangle + t\langle 4, -2, 1 \rangle$
$r_2(t) = \langle 0, 1, 1 \rangle + t\langle 2, 0, 1 \rangle$

$r_1(t)$ | $r_2(t)$

$P = \langle -1, 2, 2 \rangle$ | $P = \langle 0, 1, 1 \rangle$

$\vec{d} = \langle 4, -2, 1 \rangle$ | $\vec{d} = \langle 2, 0, 1 \rangle$

not //

$(-1, 2, 2)$ is on l_1
l_2: $x(t) = -2t \to -1 = -2t \to t = \frac{1}{2}$
$y(t) = 1 \to 2 \neq 1$
$z(t) = 1 + t \to 2 = 1 + t \to t = 1$