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12-2

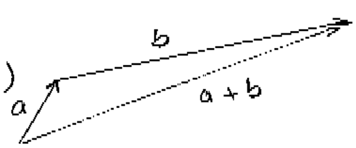
1: a) The cost of a theater ticket is a scalar, because it has only magnitude.
b) the current in a river is a vector, because it has both magnitude (speed of and direction at any given location.
c) If we assume that the initial path is linear, the initial flight path fr Houston to Dallas is a vector, because it has both magnitude and directio
d) The population of the world is a scalar, because it has only magnitude.

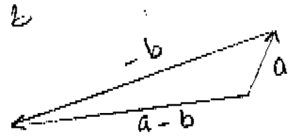
4: a) The initial point of $\overrightarrow{QR}$ is positioned at the terminal point of $\overrightarrow{PQ}$ so by the Triangle Law the sum $\overrightarrow{PQ} + \overrightarrow{QR}$ is the vector with initial point P and terminal poin R, namely $\overrightarrow{PR}$.

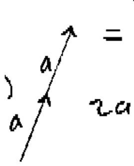
b) By the Triangle law, $\overrightarrow{RP} + \overrightarrow{PS}$ is the vector with initial point R and terminal point S, namely $\overrightarrow{RS}$.

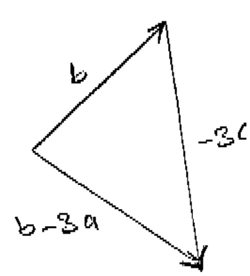
c) First we consider $\overrightarrow{QS} - \overrightarrow{PS}$ as $\overrightarrow{QS} + (-\overrightarrow{PS})$. Then since $-\overrightarrow{PS}$ has th same length as $\overrightarrow{PS}$ but points in the opposite direction, we have $-\overrightarrow{PS} = \overrightarrow{SP}$ and so $\overrightarrow{QS} - \overrightarrow{PS} = \overrightarrow{QS} + \overrightarrow{SP} = \overrightarrow{QP}$

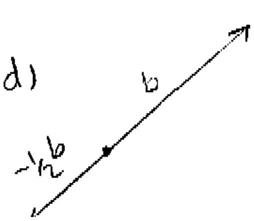
d) we use the triangle law twice: $\overrightarrow{RS} + \overrightarrow{SP} + \overrightarrow{PQ} = (\overrightarrow{RS} + \overrightarrow{SP}) + \overrightarrow{PQ}$
$= \overrightarrow{RP} + \overrightarrow{PQ} = \overrightarrow{RQ}$

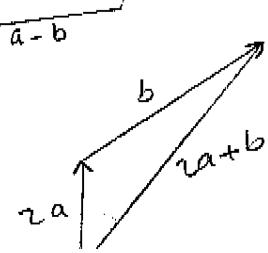
5: a)


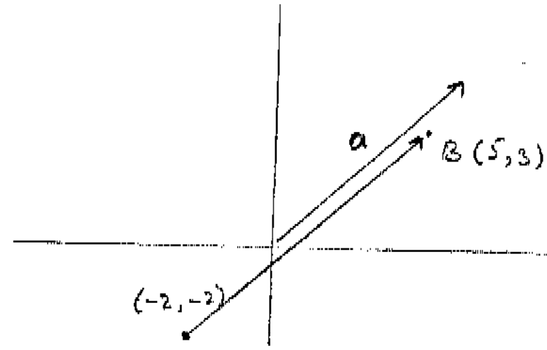
b


c)


f)


d)


e)




8: a) $= \langle 5-(-2), 3-(-2) \rangle = (7, 5)$

18.

$|a| = \sqrt{2^2 + (-3)^2} = \sqrt{13}$

$a+b = (2i - 3j) + (i + 5j) = (3i + 2j)$

$a-b = (2i - 3j) - (i + 5j) = (i - 8j)$

$2a = 2(2i - 3j) = (4i - 6j)$

$3a+4b = 3(2i - 3j) + 4(i + 5j) = (6i - 9j) + (4i + 20j) = (10i + 11j)$

24.

$|12i - 5j| = \sqrt{12^2 + (-5)^2} = \sqrt{169} = 13$ we know unit vector $= \frac{\vec{u}}{|\vec{u}|}$

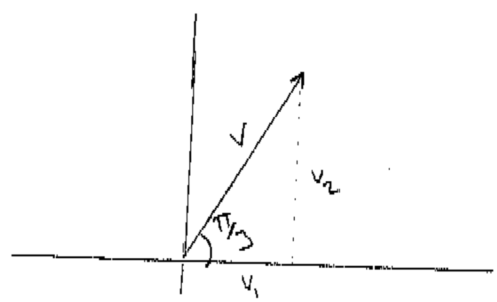
So $\Rightarrow \left(\frac{12}{13} i - \frac{5}{13} j \right)$

27:

$x \Rightarrow v_1 = |v| \cos(\pi/3) = 4 \cdot 1/2 = 2$

$y \Rightarrow v_2 = |v| \sin(\pi/3) = 4 \cdot \left(\frac{\sqrt{3}}{2}\right) = 2\sqrt{3}$

So $\Rightarrow v = \langle v_1, v_2 \rangle = (2, 2\sqrt{3})$



28.

Horizontal: $F = |F| \cos 38^\circ = 50(\cos 38^\circ) = 39.4$ N

verticle $F = |F| \sin 38^\circ = 50(\sin 38^\circ) = 30.8$ N

31 : with the respect to the water's surface, the woman's velocity is the vector sum of the velocity of the ship with respect to the water. An woman's velocity with respect to the ship. if we let north be the positive y-direction

Then $\Rightarrow$ $V = (0, 22) + (-3, 0) = (-3, 22)$

woman's speed $= |v| = \sqrt{(-3)^2 + (22)^2} = 22.2$ mil/h.

$\Rightarrow \theta = \tan^{-1}\left(\frac{22}{-3}\right) = 98°$ therefore, the woman's direction is abo

$N(98-90)° W = N 8° W$.

32 :

$T_3 = -|T_3| \cos 52° \, i + |T_3| \sin 52° \, j$

$T_5 = |T_5| \cos 40° \, i + |T_5| \sin 40° \, j$

$\Rightarrow T_3 + T_5 = (|T_3| \cos 52° + |T_5| \cos 40°) i + (|T_3| \sin 52° + |T_5| \sin 40°) j$

$= 49 j$

43 :

Consider triangle ABC, where D and E are the midpoints of AB, BC.

we know that $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$ ① and $\overrightarrow{DB} + \overrightarrow{BE} = \overrightarrow{DE}$ ②

Hower, $\overrightarrow{DB} = \frac{1}{2}\overrightarrow{AB}$ and $\overrightarrow{BE} = \frac{1}{2}\overrightarrow{BC}$

substituting these expressions for $\overrightarrow{DB}$ and $\overrightarrow{BE}$ into ② gives

$\Rightarrow \frac{1}{2}\overrightarrow{AB} + \frac{1}{2}\overrightarrow{BC} = \overrightarrow{DE}$

Compairing this with ① gives $\Rightarrow \overrightarrow{DE} = \frac{1}{2}\overrightarrow{AC}$

therefore, $\overrightarrow{AC}$ and $\overrightarrow{DE}$ are parralel and $|\overrightarrow{DE}| = \frac{1}{2}|\overrightarrow{AC}|$.