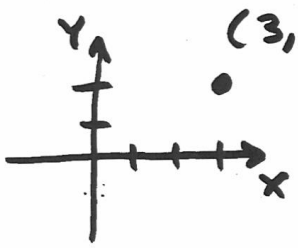
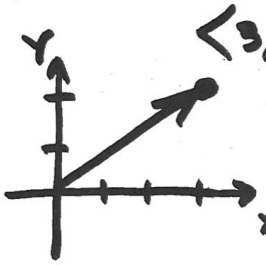
10.2 VECTORS

$V = ai + bj = \langle a, b \rangle$



POINT

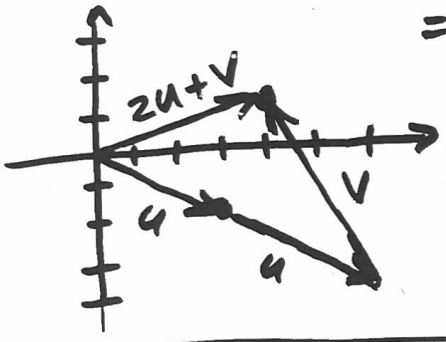


$\langle 3,2 \rangle$ OR $3i + 2j$

VECTOR

$U = \langle 3,-2 \rangle \quad V = \langle -2,5 \rangle$

FIND $2U + V$



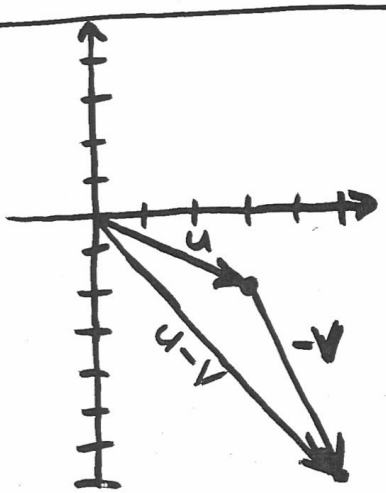
$2U + V$

$= 2\langle 3,-2 \rangle + \langle -2,5 \rangle$

$= \langle 6,-4 \rangle + \langle -2,5 \rangle$

$= \langle 4,1 \rangle$

OR $4i + 1j$



$U - V$

$= \langle 3,-2 \rangle - \langle -2,5 \rangle$

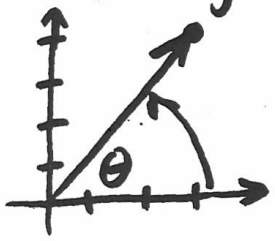
$= \langle 3,-2 \rangle + \langle 2,-5 \rangle$

$= \langle 5,-7 \rangle$

OR $5i - 7j$

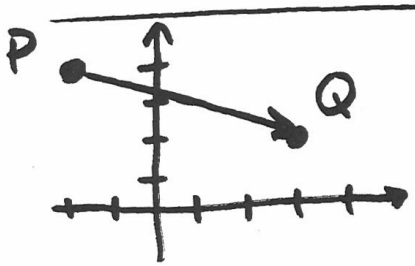
MAGNITUDE OF $V = \|V\| = \sqrt{a^2+b^2}$

$V = 3i + 4j$ $\quad \|V\| = \sqrt{3^2+4^2} = 5$



$\theta = \tan^{-1}\frac{b}{a}$ OR $\tan^{-1}\frac{b}{a} + \pi$

$= \tan^{-1}\frac{4}{3} = 53°$



$\overrightarrow{PQ} = Q - P$

$= (3,2) - (-2,4)$

$= \langle 5,-2\rangle$ OR $5i - 2j$

A UNIT VECTOR IS A VECTOR OF LENGTH (MAGNITUDE) = 1 IN THE DIRECTION OF THE GIVEN VECTOR.

UNIT VECTOR OF $V = \frac{V}{\|V\|}$

UNIT VECTOR OF $\langle 3,4\rangle = \frac{\langle 3,4\rangle}{\sqrt{3^2+4^2}}$

$= \frac{3}{5}i + \frac{4}{5}j$

HOMEWORK p. 527-528 EX. 1-9 ODD 10-12, 17, 19-21

EXAMPLE 6 p. 525

$X = \frac{t}{2} \quad Y = \sqrt{t} + 1 \quad t \geq 0$

FIND THE UNIT TANGENT & NORMAL VECTORS AT $t = 4$

$\frac{dx}{dt} = \frac{1}{2} \quad \frac{dy}{dt} = \frac{1}{2} t^{-\frac{1}{2}}$

$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\frac{1}{2}(4)^{-\frac{1}{2}}}{\frac{1}{2}} = \frac{1}{2}$

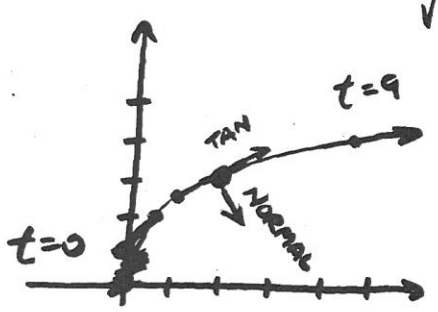
$\langle 2, 1 \rangle$ HAS A SLOPE OF $\frac{1}{2}$ $\pm$ OK

UNIT TANGENT $= \frac{\langle 2,1 \rangle}{\sqrt{2^2+1^2}} = \left\langle \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}} \right\rangle$

NORMAL = PERPENDICULAR
HAS OPPOSITE RECIPROCAL SLOPE $\left(\frac{-2}{1}\right)$

$\langle 1, -2 \rangle$ HAS A SLOPE OF -2 $\pm$ OK

UNIT NORMAL $= \frac{\langle 1,-2 \rangle}{\sqrt{1^2+(-2)^2}} = \left\langle \frac{1}{\sqrt{5}}, \frac{-2}{\sqrt{5}} \right\rangle$



HOMEWORK
528 → 23-26 ALL