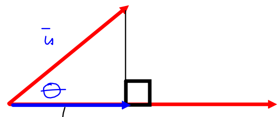
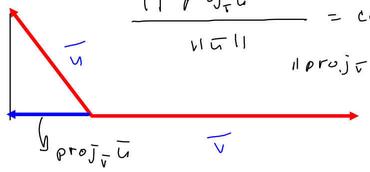
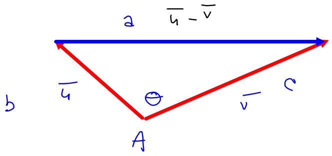
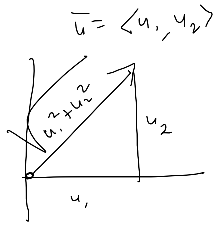


$$\frac{\|proj_{\bar{v}}\bar{u}\|}{\|\bar{u}\|} = \cos\theta$$

$\|proj_{\bar{v}}\bar{u}\| = \|\bar{u}\|\cos\theta$







Law of cosines sez

$a^2 = b^2 + c^2 - 2bc\cos\theta$

$\|\bar{u}-\bar{v}\|^2 = \|\bar{u}\|^2 + \|\bar{v}\|^2 - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

Background $\bar{u} = \langle 1, 2 \rangle$, $\bar{v} = \langle 3, 4 \rangle$,

$\Rightarrow \bar{u}\cdot\bar{v} = 1\cdot 3 + 2\cdot 4 = 3+8 = 11$

NOTE $\bar{u}\cdot\bar{u} = 1\cdot 1 + 2\cdot 2 = 1^2+2^2 = 5$

$\|\bar{u}\| = \sqrt{1^2+2^2} = \sqrt{\bar{u}\cdot\bar{u}}$

$(\bar{u}-\bar{v})\cdot(\bar{u}-\bar{v}) = \|\bar{u}\|^2 + \|\bar{v}\|^2 - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$\bar{u}\cdot\bar{u} - \bar{u}\cdot\bar{v} - \bar{u}\cdot\bar{v} + \bar{v}\cdot\bar{v} = \|\bar{u}\|^2 + \|\bar{v}\|^2 - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$\cancel{\|\bar{u}\|^2} - 2\bar{u}\cdot\bar{v} + \cancel{\|\bar{v}\|^2} = \cancel{\|\bar{u}\|^2} + \cancel{\|\bar{v}\|^2} - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$\Rightarrow \bar{u}\cdot\bar{v} = \|\bar{u}\|\|\bar{v}\|\cos\theta$

$\Rightarrow \boxed{\cos\theta = \frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|}}$ cheat sheet material

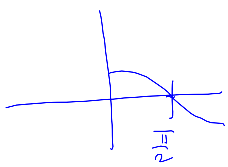
$\theta = \cos^{-1}\left[\frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|}\right]$

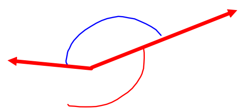
Apply this to Projection :

$\|proj_{\bar{v}}\bar{u}\| = \|\bar{u}\|\cos\theta = \|\bar{u}\| \cdot \frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|} = \frac{\bar{u}\cdot\bar{v}}{\|\bar{v}\|}$

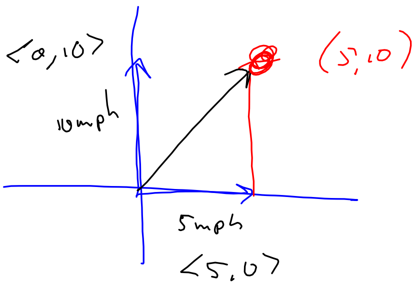
And $proj_{\bar{v}}\bar{u}$

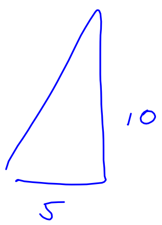
$= \left(\frac{\bar{u}\cdot\bar{v}}{\|\bar{v}\|}\right)\frac{1}{\|\bar{v}\|}\bar{v} = \frac{\bar{u}\cdot\bar{v}}{\|\bar{v}\|^2}\bar{v} = proj_{\bar{v}}\bar{u}$



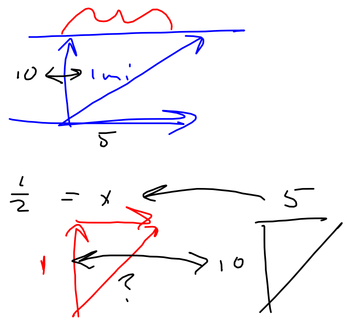


3b Resultant.





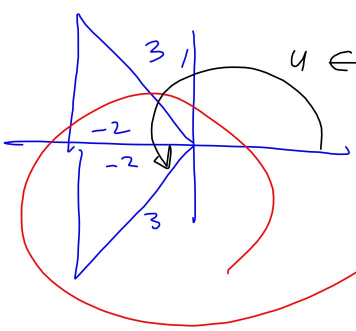
$$\langle 0,10\rangle + \langle 5,0\rangle = \langle 5,10\rangle$$



Similar triangles.

2nd B #9

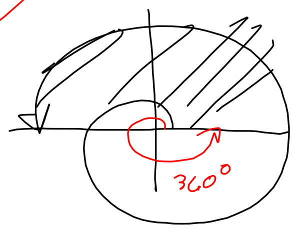
$\cos\theta = -\frac{2}{3} \ni \sin\theta < 0$



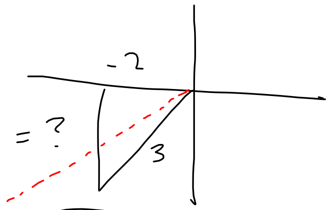
$u \in QIII$

$180^\circ < u < 270^\circ$

$360^\circ < 2u < 540^\circ$



In QII or QI — which?



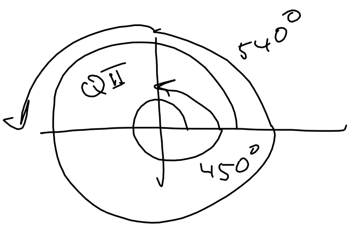
$-2.\_\_ = ?$

$\sqrt{3^2-(-2)^2}$ $\quad \sqrt{9-4} = \sqrt{5} = 2.\text{something}$

So not only is $180^\circ < \theta < 270^\circ$, but

$225^\circ < \theta < 270^\circ$

$450 < \theta < 540^\circ$



QII!

$f(x) = 6x^4 - 35x^3 + 70x^2 + 25x - 26$ 1, 2, 13, 26

1, 2, 3, 6

$f(3+2i) = 0 \Longrightarrow f(3-2i) = 0$

Divide by $x - (3+2i)$

$\pm 1, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm\frac{1}{6}, \pm 2, \pm\frac{2}{2}, \pm\frac{2}{3}, \cancel{\pm\frac{2}{6}}, \cancel{\pm\frac{1}{3}}, \pm 13, \pm\frac{13}{2}, \pm\frac{13}{3}, \pm\frac{13}{6}$

$$
\begin{array}{r|rrrrr}
3+2i & 6 & -35 & 70 & 25 & -26 \\
 & & 18+12i & -75+2i & -19-4i & 26 \\
\hline
3-2i & 6 & -17+12i & -5+2i & 6-4i & 0 \\
 & & 18-12i & 3-2i & -6+4i & \\
\hline
 & 6 & 1 & -2 & 0 &
\end{array}
$$

$(6x^2 + x - 2)(x - (3+2i))(x - (3-2i))$

$(3x+2)(2x-1)(x-3-2i)(x-3+2i)$

$6x^2 + 4x - 3x - 2$

$2x[3x+2] - 1[3x+2]$

$[3x+2][2x-1]$

$(3+2i)(-17+12i) = -51 + 36i - 34i - 24$

$= -75 + 2i$

$(3+2i)(-5+2i) = -15 + 6i - 10i - 4$

$= -19 - 4i$

$2(3+2i)(3-2i) = 2(3^2 + 2^2) = 2(13) = 26$

MAT 121

Test 3

Stuff

on harryzaims.

$\sqrt{-1} \equiv i$

$\boxed{i^2 = -1}$