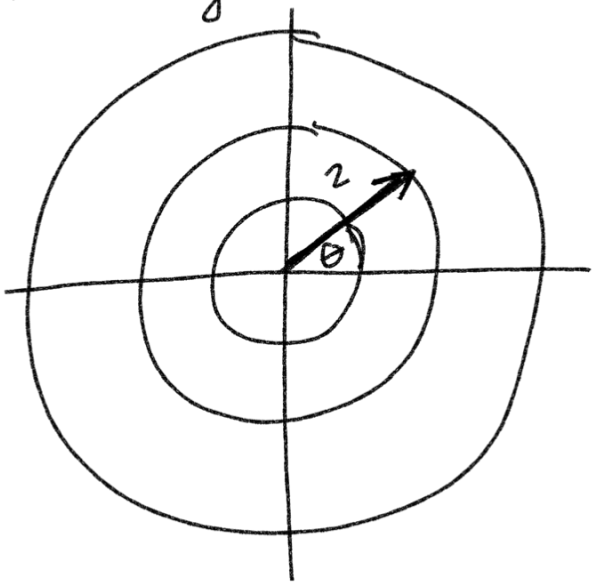
M-CT Calculus & Trigonometry 4/4

Vector → magnitude and direction

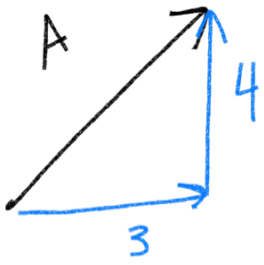


(r, θ)

$(2, \frac{\pi}{3})$

or

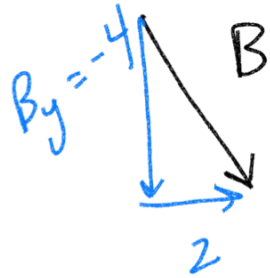
$(2, 60°)$



$A_x = 3$

$A_y = 4$

A + B



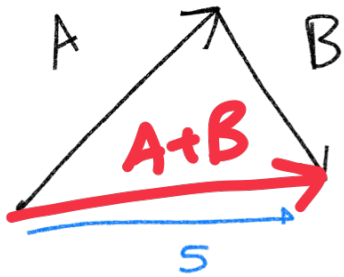
$B_x = 2$

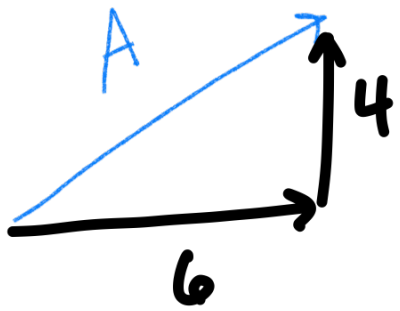
$B_y = -4$

$(A_x + B_x)$ $(A_y + B_y)$

$(3 + 2)$ $(4 + (-4))$

5 0





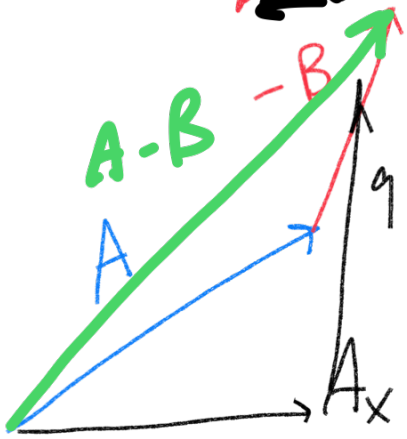
$-B$

$B\ (-2,-5)$

$-B - (-2,-5)$

$(2,5)$

$A - B$ $\quad (6,4)$



$A + (-B)$

$A_x - B_x \quad A_y - B_y$

$(6+2) \quad (4+5)$

$8 \quad 9$

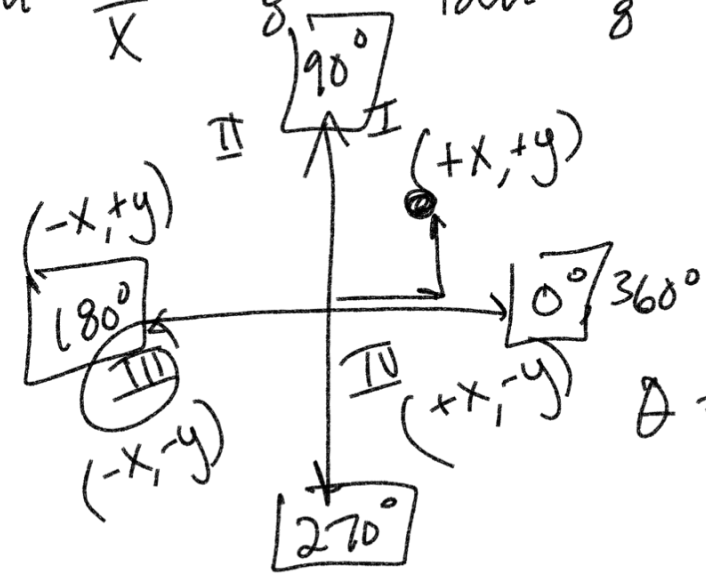
$(8,9)$

Magnitude

$r = \sqrt{x^2 + y^2}$

$\sqrt{8^2 + 9^2} = \sqrt{64 + 81}$ $\quad \boxed{\sqrt{145}}$

$\theta = \tan^{-1} \frac{y}{x}$ $\quad \frac{9}{8}$ $\quad \tan^{-1} \frac{9}{8} = 48.36$



Ex #2

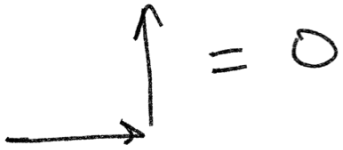
$(-3,-4)$

$\theta = \tan^{-1} \frac{-4}{-3} = \boxed{53.1}$

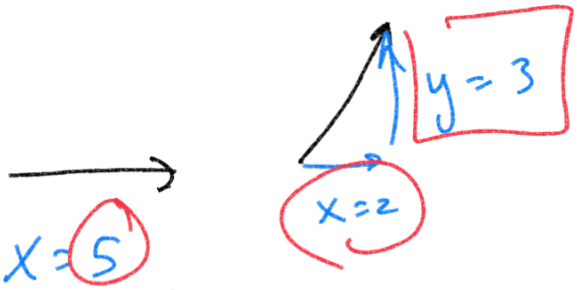
$+180$

$233.1°$

$\vec{u} \cdot \vec{v}$



$= 0$



$\vec{u} : \langle -4, 8 \rangle$ (x, y)

$\vec{v} : \langle -2, -7 \rangle$ (x, y)

$\vec{u} \cdot \vec{v} = (\vec{u}_x)(\vec{v}_x) + (\vec{u}_y)(\vec{v}_y)$

$(-4)(-2) \quad (8)(-7)$

$8 + -56 = \boxed{-48}$

$\vec{u}: \langle -4, 8 \rangle$ (x, y) $\quad \vec{v}: \langle -2, -7 \rangle$ (x, y)

Angle between two vectors

$$\cos\theta = \frac{u \cdot v}{|u||v|} \qquad \theta = \cos^{-1}\frac{u \cdot v}{|u||v|}$$

$u \cdot v = -48$ (last page)

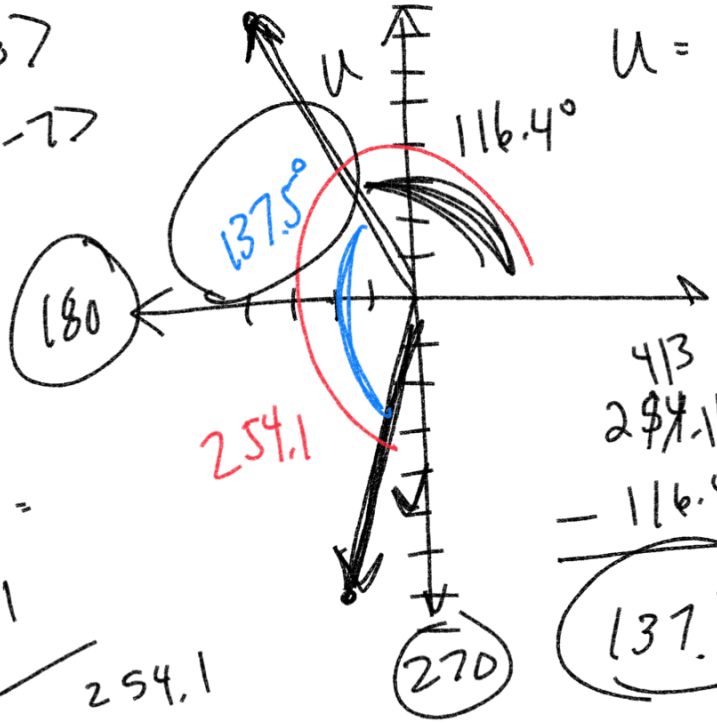
$$|u| = \sqrt{x^2+y^2} = \sqrt{(-4)^2+(8)^2} = \sqrt{16+64} = \sqrt{80} = 4\sqrt{5}$$

$$|v| = \sqrt{x^2+y^2} = \sqrt{(-2)^2+(-7)^2} = \sqrt{4+49} = \sqrt{53}$$

$$\theta = \cos^{-1}\frac{-48}{(4\sqrt{5})(\sqrt{53})} = \cos^{-1}\frac{-48}{4\sqrt{265}} \approx 137.5^\circ$$

$u = \langle -4, 8 \rangle$

$v = \langle -2, -7 \rangle$



$$u = \tan^{-1}\frac{y}{x} = \tan^{-1}\frac{8}{-4}$$

$\tan^{-1} -2$

$+180$

-63.4

116.4

$v = \tan^{-1}\frac{7}{2} = 74.1$

$74.1 + 180 = 254.1$

413

2$\$$1.11

-116.4

137.7