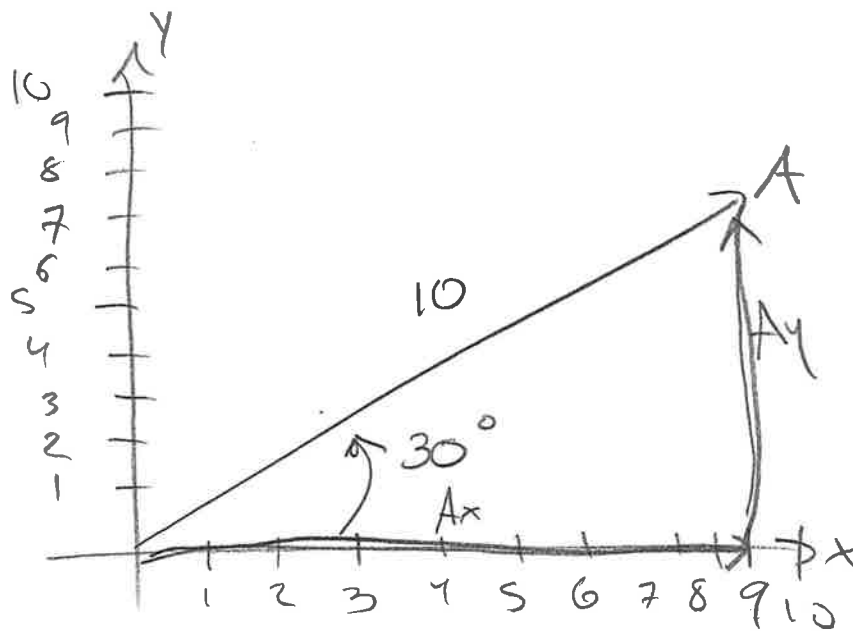


Vectors - Example

①

Vector $\vec{A}$ has magnitude 10 and makes a 30° with the $+x$ -axis.



$$A_x = |\vec{A}| \cos 30^\circ$$

$$A_x = (10) \cos 30^\circ$$

$$A_x = 8.66$$

$$A_y = |\vec{A}| \sin 30^\circ$$

$$A_y = (10) \sin 30^\circ$$

$$A_y = 5$$

$$\vec{A} = \langle A_x, A_y \rangle$$

$$\vec{A} = \langle 8.66, 5 \rangle$$

Vector Addition - Class Example

(2)

Vector $\vec{A}$ has magnitude $|\vec{A}| = 13$ and direction $\theta_A = 112.62^\circ$ and vector $\vec{B}$ has magnitude $|\vec{B}| = 5$ and direction $\theta_B = 53.13^\circ$.

$$|\vec{A}| = 13$$

$$\theta_A = 112.62^\circ$$

$$A_x = |\vec{A}| \cos \theta_A$$

$$A_x = -5$$

$$A_y = |\vec{A}| \sin \theta_A$$

$$A_y = 12$$

$$|\vec{B}| = 5$$

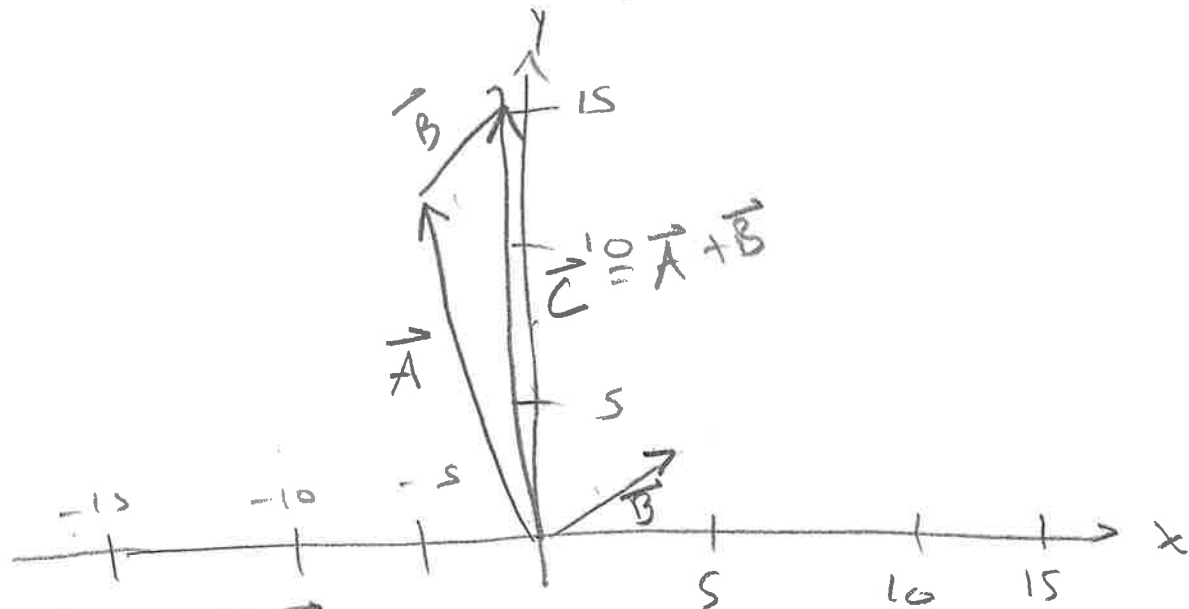
$$\theta_B = 53.13^\circ$$

$$B_x = |\vec{B}| \cos \theta_B$$

$$B_x = 3$$

$$B_y = |\vec{B}| \sin \theta_B$$

$$B_y = 4$$



$$\vec{C} = \vec{A} + \vec{B}$$

$$C_x = A_x + B_x$$

$$C_x = (-5) + (3)$$

$$\boxed{C_x = -2}$$

3

$$C_y = A_y + b_y$$

$$C_y = (12) + (4)$$

$$C_y = 16$$

$$\vec{C} = \langle -2, 16 \rangle$$

Find magnitude and direction of $\vec{C}$

$$|\vec{C}|^2 = C_x^2 + C_y^2$$

$$|\vec{C}|^2 = (-2)^2 + (16)^2$$

$$|\vec{C}|^2 = 4 + 256$$

$$\sqrt{|\vec{C}|^2} = \sqrt{260}$$

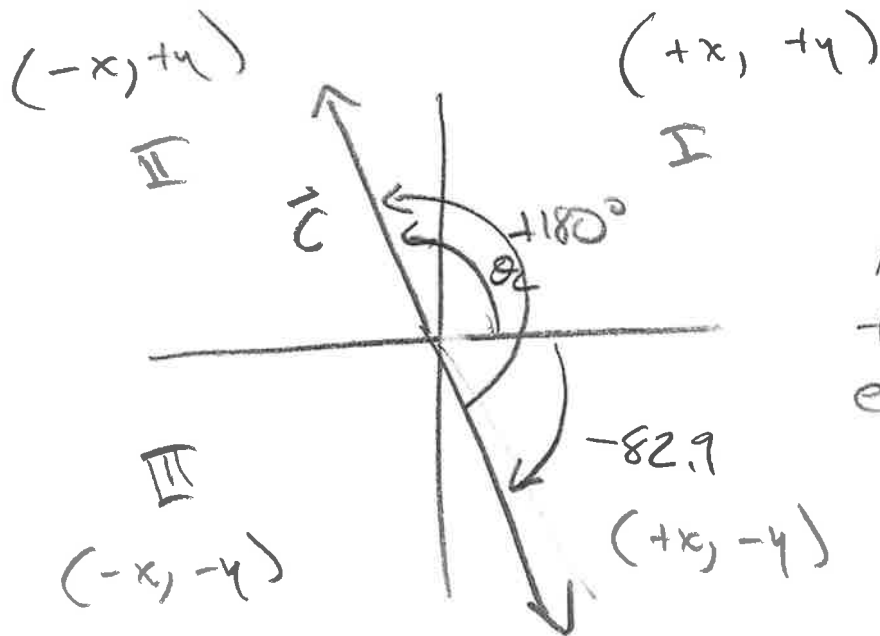
$$|\vec{C}| = 16.12$$

$$\theta_C = \tan^{-1} \left(\frac{C_y}{C_x} \right)$$

$$\theta_C = \tan^{-1} (16/-2)$$

Calculator reports:

$$\theta_C = -82.7^\circ \quad (\text{Quadrant IV})$$



Answer is 180°
to what we
expect.

$$\theta_c = -82.9^\circ + 180^\circ$$

$$\theta_c = 97.13^\circ \text{ (Quadrant II)}$$

Inverse tan sometimes gives inaccurate answers. Usually fixed by adding 180° .
Draw each problem and determine on a case-by-case basis.

Converting Temperature — Example

⑤

The Sun has a surface temperature of $T = 5780 \text{ K}$. Convert this temperature to Fahrenheit.

$$C = K - 273.15$$

$$C = (5780) - 273.15$$

$$C = 5507^\circ\text{C}$$

$$F = 1.8 C + 32$$

$$F = 1.8 (5507) + 32$$

$$F = 9912.6 + 32$$

$$\boxed{F = 9944.6^\circ\text{F}}$$

