Example #1 p. 5 Ch. 9

To the nearest 10th of a degree, find the angle between

$\mathbf{u} = \langle 5, -12 \rangle$ & $\mathbf{v} = \langle 4, 3 \rangle$

Find the magnitude of $u = \langle 5, -12 \rangle$, $|u|$

- Magnitude of u is $c = \sqrt{a^2 + b^2}$

So, $c = \sqrt{25 + 144} = \sqrt{169} = 13$

$|u| = 13$

Find the magnitude of v = <4, 3>, |v|

- Magnitude of v is $c = \sqrt{a^2 + b^2}$

So, $c = \sqrt{16 + 9} = \sqrt{25} = 5$

$|v| = 5$

Find the dot product of u & v

- Multiply the vertical components of u & v

$$u_a \bullet v_a = 5 \bullet 4 = 20$$

- Multiply the horizontal components of u & v

$$u_b \bullet v_b = -12 \bullet 3 = -36$$

- The dot product is a scalar. Sum vertical & horizonatl component products

$$u \text{ dot } v = 20 + -36 = -16$$

Use the dot product formula to solve for θ

- Using the fact that the dot product of u & v is equal to |u||v| cos θ, θ can be found as

$$\theta = \cos^{-1} \frac{u \text{ dot } v}{|u||v|}$$

So, $$\theta = \cos^{-1} \frac{-16}{13 \bullet 5} \approx 104.2500327°$$

Thus, θ is

$\theta \approx 104.3°$