

P.433-
434

51.

6-4 VECTORS AND DOT PRODUCTS

$$u = \langle 5, -4 \rangle$$

$$v = \langle -1, 7 \rangle$$

$$\text{vector addition} = u + v = \langle 4, 3 \rangle$$

$$\text{scalar multiplication} = ku = 3u = \langle 15, -12 \rangle$$

$$\text{dot product} = u \cdot v$$

$$5 \cdot -1 + -4 \cdot 7$$

$$-5 + -28$$

$$-33$$

Properties of Dot Products - p.438

$$u \bullet v = v \bullet u$$

$$0 \bullet v = 0$$

$$u \bullet (v + w) = u \bullet v + u \bullet w$$

$$c(u \bullet v) = cu \bullet v$$



$$v \bullet v = \|v\|^2$$

$$\|v\| = \sqrt{v \bullet v}$$

Ex 1 Find the length of u

$$u = \langle 2, -6 \rangle \quad \langle 2, -6 \rangle$$

$$\|u\| = \sqrt{u \bullet u} = \sqrt{40} = 2\sqrt{10}$$

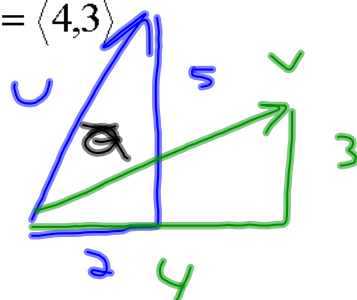
$$u \bullet u = 4 + 36 = 40$$

The angle between two vectors - $\cos \theta = \frac{u \bullet v}{\|u\| \|v\|}$

Ex 2 Find the angle between $u = \langle 2, 5 \rangle$ and $v = \langle 4, 3 \rangle$

$$\cos \theta = \frac{2 \cdot 3}{\sqrt{29} \cdot 5}$$

$$\theta = 31.3^\circ$$

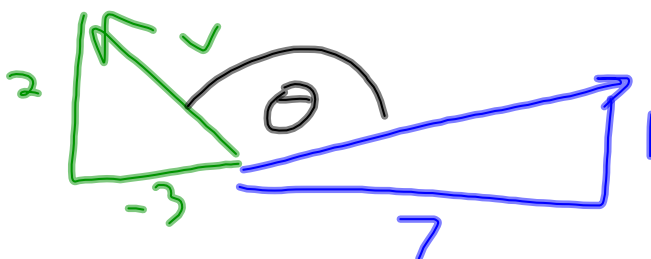


The angle between two vectors - $\cos \theta = \frac{u \bullet v}{\|u\| \|v\|}$

Ex 3 Find the angle between $u = \langle 7, 1 \rangle$ and $v = \langle -3, 2 \rangle$

$$\cos \theta = \frac{-19}{\sqrt{13} \sqrt{50}}$$

$$\theta \approx 138.2^\circ$$



u and v are orthogonal if $u \bullet v = 0$

↓
means perpendicular
except $\langle 0, 0 \rangle$ is
orthogonal to every vector

Homework
p.445
1-21 odds