

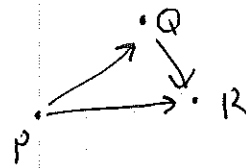
Math 213

Solutions to some In-class Problems

1. Is the triangle with vertices

$$P(1, -3, -2) \quad Q(2, 0, -4), \quad R(6, -2, -5)$$

a right triangle?



Solution:

$$\vec{PQ} = \langle 1, 3, -2 \rangle$$

$$\vec{PR} = \langle 5, 1, -3 \rangle$$

$$\vec{QR} = \langle 4, -2, -1 \rangle = -\vec{RQ}$$

$$\vec{PQ} \cdot \vec{PR} = 5 + 3 + 6 \neq 0$$

$$\vec{PR} \cdot \vec{QR} = 20 - 2 + 3 \neq 0$$

$$\vec{PQ} \cdot \vec{QR} = 4 - 6 + 2 = 0$$

so $\triangle PQR$ is a right triangle.

2. Find the scalar and vector projections of

$$\vec{b} = \langle 4, 6 \rangle \text{ onto } \vec{a} = \langle -5, 12 \rangle$$

1/14/19 (2)

$$|\vec{a}| = \sqrt{5^2 + 12^2} = \sqrt{169} = 13$$

$$\vec{a} \cdot \vec{b} = -20 + 72 = 52$$

$$|\vec{b}| = \sqrt{4^2 + 6^2} = \sqrt{52}$$

$$\text{comp}_{\vec{a}} \vec{b} = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}|} = \frac{52}{13} \quad (\text{scalar projection})$$

$$\text{proj}_{\vec{a}} \vec{b} = \frac{(\vec{a} \cdot \vec{b})}{|\vec{a}|^2} \vec{a} = \frac{52}{169} \cdot \langle -5, 12 \rangle$$

Remember the key formula:

$$\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta$$

