Math 162A - Quiz #3 – Au08 (OSU)

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Name:

Signature:

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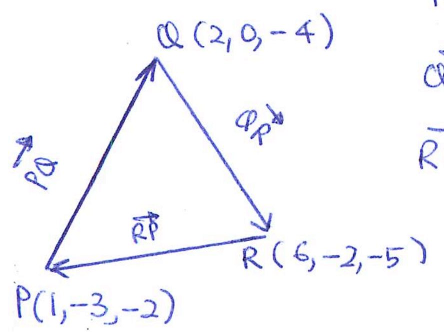
Instructions. The point value of each problem is indicated in square brackets. To obtain full credit, you must have the correct answers along with relevant supporting work to justify them. Partial credit will be given based on the work that is shown. However, ***answers without supporting work will receive no credit.***

Problem 1. Use vectors to decide whether the triangle with vertices $P(1,-3,-2)$, $Q(2,0,-4)$, and $R(6,-2,-5)$ is right-angled. [6pts]



$\vec{PQ} = \langle 2-1, 0-(-3), -4-(-2)\rangle = \langle 1, 3, -2\rangle$

$\vec{QR} = \langle 6-2, -2-0, -5-(-4)\rangle = \langle 4, -2, -1\rangle$

$\vec{RP} = \langle 1-6, -3-(-2), -2-(-5)\rangle = \langle -5, -1, 3\rangle$

$\vec{PQ} \cdot \vec{QR} = (1)(4)+(3)(-2)+(-2)(-1) = 0,$

So $\vec{PQ}$ and $\vec{QR}$ are $\perp$ and the triangle PQR is right-angled.

Problem 2. Find the vector projection of $\vec{a}=2\vec{i}-3\vec{j}+\vec{k}$ onto $\vec{b}=\vec{i}+6\vec{j}-2\vec{k}$. [4pts]

projection of $\vec{a}$ onto $\vec{b}$

$$= \text{proj}_{\vec{b}}\,\vec{a}$$

$$= \left(\frac{\vec{a}\cdot\vec{b}}{|\vec{b}|}\right)\frac{\vec{b}}{|\vec{b}|}$$

$$= \left(\frac{\vec{a}\cdot\vec{b}}{|\vec{b}|^2}\right)\vec{b}$$

$$= \frac{-18}{41}\langle 1, 6, -2\rangle$$

$\vec{a}\cdot\vec{b} = (2)(1)+(-3)(6)+(1)(-2)$

$= -18$

$|\vec{b}|^2 = (1)^2+(6)^2+(-2)^2 = 41$