Math 2204: Written HW 1 (Due Friday 1/31, 5pm)

Unallowed tools for HWs (see the course policy)

- **Calculators or other software**

- **Solution manuals, websites (Chegg, CourseHero etc.)**

Include a formula you use in the write-up of that problem

Hand in all work and reasoning for the following problems

- **Section 12.1**: 6, 7, 17, 33 (and sketch), 42 (and sketch).

- **Section 12.2**: 5bf, 13, 27, 31, 35, 37.

- **Section 12.3**: 4

A) Sketch <u>and</u> describe in words the following regions of $\mathbb{R}^3$. **Use dashed or solid lines when necessary and clearly mark relevant positions in a sketch.**
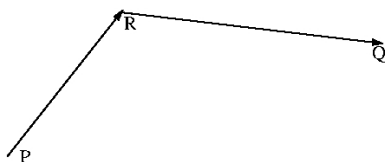**Clearly describe in words which points are included and which ones not.**

1. $y^2 + z^2 = 2$.
2. $y^2 + (z-2)^2 < 4$.
3. $x^2 + y^2 + z^2 \geq 3 - 2y$.

B) Let $\boldsymbol{a} = \langle -\sqrt{2}, 1, -1 \rangle$ and $\boldsymbol{b} = \langle 2, \sqrt{2}, \sqrt{2} \rangle$.

1. Find a unit vector in the direction of $-\boldsymbol{b}$.
2. Sketch $\boldsymbol{a}$, $\boldsymbol{b}$, and the angle between the vectors $\boldsymbol{a}$ and $\boldsymbol{b}$.
3. Compute the angle between $\boldsymbol{a}$ and $\boldsymbol{b}$.

C) $\overrightarrow{PR}$ and $\overrightarrow{RQ}$ are two-dimensional vectors in the diagram below.

1. **CONSTRUCT** $\overrightarrow{RQ} - \overrightarrow{PR}$.

2. Is $\overrightarrow{PR} \cdot \overrightarrow{RQ}$ positive, negative, or zero? <u>Explain</u>.

3. **CONSTRUCT** the vector projection of $\overrightarrow{RQ}$ onto $\overrightarrow{PR}$.

4. **CONSTRUCT** the vector projection of $\overrightarrow{PR}$ onto $\overrightarrow{RQ}$.

5. Indicate in the figure the scalar projection of $\overrightarrow{PR}$ onto $\overrightarrow{RQ}$. Is it positive, negative, or zero? <u>Explain</u>.