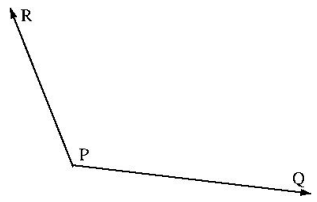
Math 3214: HW1 (Due Wednesday 1/29, 5 pm)

To obtain (full) credit, show all reasoning and work. No calculator or other electronic devices for HWs.

1. Consider the vectors $\boldsymbol{F} = -\boldsymbol{i} + 3\boldsymbol{j} + \boldsymbol{k}$ and $\boldsymbol{d} = \overrightarrow{AB}$ where $A = (0, 2, -3)$ and $B = (2, 5, 4)$.
   (a) Are $\boldsymbol{F}$ and $\boldsymbol{d}$ orthogonal? Give a reason.
   (b) Find the work done by the force field $\boldsymbol{F}$ when moving an object along a straight line from point A to point B.
2. $\overrightarrow{PR}$ and $\overrightarrow{RQ}$ are two-dimensional vectors in the diagram below.



   a. Is $\overrightarrow{PR} \cdot \overrightarrow{PQ}$ positive, negative, or zero? Explain.
   b. Is $\overrightarrow{PR} \times \overrightarrow{PQ}$ into the page or out of the page? Explain.
3. Section 1.3: 5.
4. Section 1.3: 7. Use the formula with a dot and cross product in it.
5. Section 1.3: 11.
6. Section 1.3: 13.
7. Section 1.3: 15c.
8. Review exercises for Ch. 1 (p. 70): 3b. Also sketch the line.
9. Review exercises for Ch. 1 (p. 70): 5. Also sketch the plane.
10. Sketch the following surfaces using the procedure outlined in the Ch. 2 slides, i.e.:
    Determine for which traces you have points, no solution, or elliptical traces.
    Name each surface, clearly indicate one ellipse size, and label axes.
    Very limited credit if you don't follow the procedure from the Ch. 2 slides.
    a) Section 2.1: 27.
    b) Section 2.1: 31.
    c) $x^2 + 4y^2 = (z-1)^2 - 4$.
    d) $x^2 - y^2 + 4y - 4z^2 = 3$.
    e) The graph of $f(x, y) = \sqrt{4x^2 + y^2}$.
11. Section 2.3: 9c.
12. Section 2.3: 9d.
13. Compute the matrix of partial derivatives of $f(x, y, z) = (xz,\ y - 2z,\ x^2 \cos(xy))$.