1. Warm up. Is the angle between <2,3,2> and <-3,1,2> obtuse or acute?

2. For what values of \( \alpha \) is \( \mathbf{a} \) orthogonal to \( \mathbf{b} - \alpha \mathbf{a} \)? What about the special case where \( \|\mathbf{a}\| = 1 \)? The case where \( \|\mathbf{a}\| = 0 \)?

3. Given a helix curve in parametric vector form as \( \mathbf{P}(t) = < r\cos(t), h*t, r\sin(t)> \), what is the tangent vector \( \mathbf{T} \) to the curve? What is the normal vector \( \mathbf{N} \) (which is \( \mathbf{T}' \))? And what is the binormal vector \( \mathbf{B} \) (which is \( \mathbf{T} \times \mathbf{N} \))? 

4. For the previous problem the appropriate range of \( t \) isn’t important – for actually drawing a helix, picking the range of \( t \) to appropriate scale \( h \) and the number of twists is important. Redo the helix equation so as \( t \) goes from 0 to 1, the helix makes \( N \) full turns and rises to a height \( h \).

5. For the lecture example for the midpoint of a triangle, calculated by first blending the line segment between two points \( P_0 \) and \( P_1 \), and then blending that equation with the third point \( P_2 \), show that (a) if you hold \( s \) constant then varying \( t \) sweeps out a line, and (b) those lines of constant \( s \) are parallel to the line from \( P_0 \) to \( P_1 \).

6. If you have \( \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = 0 \), what does it mean for the relationship of the three vectors?

7. Find the normal vector to the triplets below, if it exists:
   a) \( P_1=(1,1,1), P_2=(1,2,1), P_3=(3,0,4) \)
   b) \( P_1=(8,16,2), P_2=(-8,-16,-2), P_3=(4,8,1) \)