Math 220 Worksheet 1

To be done in teams without books or notes. **Names:** _____

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1. (12.5 minutes, 1995 Final Exam).

   a If $\mathbf{v} = 2\,\mathbf{i} + \mathbf{j} + 2\,\mathbf{k}$ and $\mathbf{w} = -2\,\mathbf{i} + \mathbf{j} - 2\,\mathbf{k}$ then find a vector that is perpendicular both to $\mathbf{v}$ and to $\mathbf{w}$.

   (b) Do the vectors $\mathbf{v}$ and $\mathbf{w}$ in (a) and the vector $\mathbf{k}$ determine a parallelepiped in $\mathbf{R}^3$? If so, of what volume? If not, why not?

   (c) Find a scalar equation for the plane through the points $(1, 0, 1)$, $(3, 1, 3)$, and $(-1, 1, -1)$ in $\mathbf{R}^3$.

2. (7.5 minutes, 1996 Exam 1) A particle moves on the curve $\mathbf{x} = \mathbf{f}(t) = (\sin t - t\,\cos t)\,\mathbf{i} + (\cos t + t\,\sin t)\,\mathbf{j} + t^2\,\mathbf{k}$, for $t \geq 0$. Find

   (a) formulas for the velocity and speed at any time t.

   (b) the unit tangent vector $\mathbf{T}$ at the point corresponding to $t = \pi$.

   (c) parametric scalar equations for the tangent line to the curve at the point where $t = \pi$.