Duration: 50 minutes

Instructions: Answer all questions, without the use of books or calculators. You may have a half sheet of 8.5X11 paper with both sides filled out. Partial credit will be awarded for correct work. You may use the back of the pages of the exam should it be necessary, but please indicate in writing that you have done so. The total number of points is 100.

Problem	Score
1	
2	
3	
4	
5	
6	
Total	

1. (15 points) Find a vector that has the same direction as $\langle -2, 4, 2 \rangle$ but has length 6.

2. (15 points) Find the projection of $\langle 3, 6, -2 \rangle$ onto $\langle 1, 2, 3 \rangle$.

3. (15 points) Find an equation for the plane which contains the points $(0, 1, 1)$, $(1, 0, 1)$, and $(1, 1, 0)$.

4. (20 points) The tangent lines to the curve $\mathbf{r}(t) = \langle \sin \pi t, 2 \sin \pi t, \cos \pi t \rangle$ at $t = 0$ and $t = 0.5$ intersect at a point. Find this point.

5. (20 points) Classify and sketch the surface given by the equation $4x^2 + y^2 + 4z^2 - 4y - 24z + 36 = 0$.

6. (15 points) Find and sketch the domain of $f(x, y) = \ln(x + y - 1)$.