Fake name: _____
(Don't use your real name, but a made up one)

Math 131 Multivariate Calculus

Diagnostic Test

The purposes of this test are (1) to help you determine what things about linear algebra you should brush up on, and (2) to let me know which topics we should review as a class.

Problem 1. On vectors and vector arithmetic.

a. Add these vectors.

$(3, 2, -4) + (2, -1, 0) =$ _____

b. Compute

$5(1, 2) - 3(2, 2) + (0, 3) =$. _____

c. The displacement vector from $(0, 1, 2)$ to $(3, 3, 5)$ is _____

d. If the vector $\mathbf{a}$ goes from point P to point Q while the vector $\mathbf{b}$ goes from point P to point R, then the vector $\mathbf{b} - \mathbf{a}$ goes from which point to which point?

From _____ to _____

e. Write the vector $4\mathbf{i} + 5\mathbf{j} - 6\mathbf{k}$ in coordinate form. _____

Problem 2. On parametric curves.

a. The curve given in parametric form by the equations $(x, y) = (\cos\theta, \sin\theta)$ is a

_____

b. Give parametric equations $(x(t), y(t), z(t))$ with parameter t for the straight line passing through the points $(1, 2, 1)$ and $(3, 6, -1)$.

$x(t) =$ _____

$y(t) =$ _____

$z(t) =$ _____

Problem 3. On dot products and lengths of vectors.

a. The length (also called norm) of the vector $(0, 4, 3)$ is _____

b. Compute the dot product (also called inner product or scalar product)

$(2, 3, 1) \cdot (2, -1, 2) =$ _____

c. A unit vector in the direction of $(1, 1)$ is _____

d. The distance between the vectors $(2, 2)$ and $(7, 14)$ is _____

e. If $\mathbf{a} = (2, 4)$ and $\mathbf{b} = (1, 3)$, then the cosine of the angle θ between $\mathbf{a}$ and $\mathbf{b}$ is

$\cos\theta =$

Problem 4. On determinants, cross products, and areas.

a. Evaluate the determinant

$$\begin{vmatrix} 2 & 3 & 1 \\ 0 & -1 & 2 \\ 1 & 0 & 4 \end{vmatrix} =$$

b. Compute the cross product (also called outer product or vector product)

$(2, 0, 1) \times (0, 1, 2) =$

c. Name a vector perpendicular to the vectors $(2, 0, 1)$ and $(0, 1, 2)$ used in part **b**.

_____

d. Consider the parallelogram in $\mathbf{R}^3$ three of whose vertices are $(0, 0, 0)$ and the two vectors $(2, 0, 1)$ and $(0, 1, 2)$ used in part **b**. The area of this parallelgram is

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