EXAM 1

Math 212, 2014-2015 Fall, Clark Bray.

You have 50 minutes.

No notes, no books, no calculators.

YOU MUST SHOW ALL WORK AND EXPLAIN ALL REASONING
TO RECEIVE CREDIT. CLARITY WILL BE CONSIDERED IN GRADING.
All answers must be simplified. All of the policies and guidelines
on the class webpages are in effect on this exam.

Good luck!

Name _____

"I have adhered to the Duke Community
Standard in completing this
examination."

1. _____

2. _____ Signature: _____

3. _____

4. _____

5. _____

6. _____

Total Score _____ (/100 points)

1. *(20 pts)*

(a) Use the geometric interpretations of cross product to find the vector $\vec{v}$ for which

i. $\vec{v} \times (3, 2, 1) = (1, 1, -5)$

ii. $\vec{v} \times (2, 3, 2) = (3, -2, 0)$

iii. $\|\vec{v}\| = \sqrt{14}$

(b) Compute the vector $\vec{w}$ whose component in the direction of $(3, 4)$ is 2, and whose component in the direction of $(5, 12)$ is 1.

2. *(15 pts)* The line L is parallel to the planes with equations $x - y - z = 0$ and $x + 2y + 3z = 9$, and passes through the point $(2, 3, 1)$. Find a parametrization of L, and the symmetric equations for L.

3. *(15 pts)* Find the equation of the ellipsoid with center at $(4, -2, 3)$ that is tangent to all three of the coordinate planes.

4. *(15 pts)* The curve C in the xy-plane has equation $y = 4\sin(3x)$.

   (a) Find the domain, target, and formula for a function f whose *graph* is the curve C.

   (b) Find the domain, target, and formula for a function g for which one of the *level sets* is the curve C.

   (c) Find the domain, target, and formula for a function h that *parametrizes* the curve C.

5. *(15 pts)* Find the limit below, or show that it does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{x^4 + y^2}{x^2 + y^4}$$

6. *(20 pts)* Suppose we are given $x = by - q$, $b = rz + ra$, $y = r - z$, $p = b + yq$, and $q = arz$. Find an expression for $\partial p/\partial z$, and its value when $a = 2$, $r = 1$, $z = 3$.