**University of California, San Diego**
**Department of Mathematics**

Name: _____ PID: _____

Discussion Section: _____

**Instructions**

1. Write your *Name*, *PID*, *Section*, and *Exam Version* on the front of your Blue Book.
2. No calculators or other electronic devices are allowed during this exam.
3. You may use one page of notes, but no books or other assistance during this exam.
4. Read each question carefully, and answer each question completely.
5. Write your solutions clearly in your Blue Book.
   (a) Carefully indicate the number and letter of each question and question part.
   (b) Present your answers in the same order they appear in the exam.
   (c) Start each problem on a new page.
6. Show all of your work. No credit will be given for unsupported answers, even if correct.
7. Turn in your exam paper with your Blue Book.

0. Carefully read and complete the instructions at the top of this exam sheet and any additional   (1)
instructions written on the chalkboard during the exam.

1. (a) If $\theta$ is the angle between the vectors $\vec{v} = \langle -2, 2, 1 \rangle$ and $\vec{w} = \langle 1, 3, -2 \rangle$, compute $\cos\theta$.   (10)

   (b) Compute $\vec{v} \times \vec{w}$.

   (c) Find a unit vector in the same direction as $\vec{v}$.

2. (a) Find parametric equations for the line through the point $P_0 = (1, 3, -1)$ and perpendicular   (10)
to the plane $3x - y + 2z = 2$.

   (b) What are the coordinates of the point where the line intersects the plane?

3. Suppose $\vec{u}$ and $\vec{w}$ are unit vectors for which $\|\vec{u} + \vec{w}\| = 3/2$. Compute $\|\vec{u} - \vec{w}\|$.   (9)

4. Find the equation of the plane tangent to the surface $z = f(x, y)$ at the point $(3, 1, f(3, 1))$ if   (10)

$$f(x, y) = e^{x^2 - 9y}.$$

(This exam is worth 40 points.)