

Quiz 3 - Math 53
September 18, 2008

Name _____

Let \mathbf{a} , \mathbf{b} , \mathbf{c} , and \mathbf{d} be vectors in three dimensions, no two of them parallel. Let $V(\mathbf{a}, \mathbf{b})$ denote the plane through the origin consisting of all vectors of the form $\lambda\mathbf{a} + \mu\mathbf{b}$ (λ and μ constants). Let $\mathbf{r} = \langle x, y, z \rangle$ be a variable vector.

a)[3pts] Find vector equations for the planes $V(\mathbf{a}, \mathbf{b})$ and $V(\mathbf{c}, \mathbf{d})$. Find a formula for the cosine of the angle between these two planes. *Do not use components.*

b)[3pts] Find a parameterization of the line that is the intersection of $V(\mathbf{a}, \mathbf{b})$ and $V(\mathbf{c}, \mathbf{d})$ (Hint: the line is in both planes, so it must be orthogonal to both normal vectors). Demonstrate that the direction vector of this line is in $V(\mathbf{c}, \mathbf{d})$ by writing it in the form $\lambda\mathbf{c} + \mu\mathbf{d}$ for some constants λ and μ . *Do not use components.*

c)[3pts] If $\mathbf{a} = \langle 3, 0, 4 \rangle$, $\mathbf{b} = \langle 0, 1, 0 \rangle$, $\mathbf{c} = \langle 2, 2, 1 \rangle$, and $\mathbf{d} = \langle 1, 0, 1 \rangle$, Find equations for the planes $V(\mathbf{a}, \mathbf{b})$ and $V(\mathbf{c}, \mathbf{d})$. Compute the *cosine* of the angle between these two planes. Find a parameterization of the intersection of these two planes.