Math 4355 – Spring 2021 Name:

Quiz #2

Please, type or write legibly, scan, save file as LASTNAME_FIRSTNAME_Q2.pdf and email to `dlabate@math.uh.edu` or `dlabate@uh.edu`. You need to email to me no later than 11:30AM on Jan 28.

(1) [5 Pts] Compute the orthogonal complement W of the space V in $\mathbb{R}^3$ spanned by the vector $(2, 1, -1)$

(2) [5 Pts] Find two linearly independent vectors in W.

(3) [2 Pts Extra credit] Find an ONB of W.

SOLUTION

(1) The orthogonal complement to V is the plane of equation

$$2x + y - z = 0$$

(2) Here are 2 linearly independent vectors in W (they are vectors in the plane, i.e., they satisfy the plane equation)

$$(1, -2, 0), \quad (0, 1, 1)$$

(3) We can take the cross product of $(2, 1, -1)$ and $(0, 1, 1)$ to find a vector orthogonal to $(0, 1, 1)$

We find $(0, 1, 1) \wedge (2, 1, -1) = (-2, 2, -2)$.

Now we can nomalize the vectors to get an ONB of W:

$$\frac{1}{\sqrt{2}}(0, 1, 1), \quad \frac{1}{\sqrt{3}}(-1, 1, -1)$$