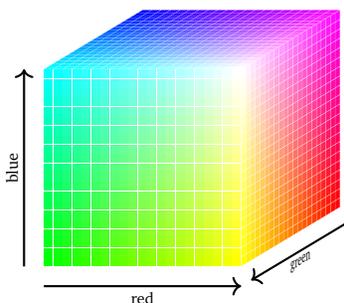


## Math 1553 Worksheet §1.7, 1.8, 1.9

- Every color on my computer monitor is a vector in  $\mathbf{R}^3$  with coordinates between 0 and 255, inclusive. The coordinates correspond to the amount of red, green, and blue in the color.



Given colors  $v_1, v_2, \dots, v_p$ , we can form a “weighted average” of these colors by making a linear combination

$$v = c_1 v_1 + c_2 v_2 + \dots + c_p v_p$$

with  $c_1 + c_2 + \dots + c_p = 1$ . Example:

$$\frac{1}{2} \text{ (red square)} + \frac{1}{2} \text{ (blue square)} = \text{ (purple square)}$$

Consider the colors on the right. Are these colors linearly independent? What does this tell you about the colors?

After doing this problem, check out the [interactive demo](#), where you can adjust sliders to find a prescribed color.

$$\begin{pmatrix} 240 \\ 140 \\ 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 120 \\ 100 \end{pmatrix} \quad \begin{pmatrix} 60 \\ 125 \\ 75 \end{pmatrix}$$



2. The second little pig has decided to build his house out of sticks. The big bad wolf finds the pig's house and blows it down so that the house is rotated by an angle of  $45^\circ$  in a counterclockwise direction about the  $z$ -axis (look downward onto the  $xy$ -plane the way we usually picture the plane as  $\mathbf{R}^2$ ), and then projected onto the  $xy$ -plane. Find the matrix for this transformation.

3. Which of the following transformations  $T$  are onto? Which are one-to-one? If the transformation is not onto, find a vector not in the range. If the matrix is not one-to-one, find two vectors with the same image.

a) The transformation  $T : \mathbf{R}^3 \rightarrow \mathbf{R}^2$  defined by  $T(x, y, z) = (z, x)$ .

b) The matrix transformation with standard matrix  $A = \begin{pmatrix} 1 & 3 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}$ .