Assignment

Name : Faisal Ahmed

ID : 2130$186

Section : 11

Course : CSE423 (ASA).

Problem 1

(a) The color models used in the devices used by Mr. David are Additive color model and subtractive color model.

Mr. David opened the microsoft word file and checked it on the monitor. We know that, if we work on a computer, the colors we see on the screen are created with light using additive color model. As, the additive color mixing begins with black and adding more colour makes it white. The outcome is to tends to white.

Mr. David printed the file using color printer. When color is mixed through printing process, subtractive color method is used. It refers that as color is added it tends to black and the outcome gets darker.

b) We know,

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} C \\ M \\ Y \end{bmatrix}$$

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} 0.4 \\ 0.5 \\ 0.7 \end{bmatrix}$$

$$= \begin{bmatrix} 0.6 \\ 0.5 \\ 0.3 \end{bmatrix}$$

So, here, $C_{max} = 0.6$ (Red) $C_{min} = 0.3$ (Blue)

So, difference $= 0.6 - 0.3 = 0.3$

So, $h = (G - B)$ / difference $= (0.5 - 0.3)$ / difference

$$= \frac{0.2}{0.3} = 0.667$$

So, Hue $= h * 60 = 0.667 * 60 = 40^\circ$

$$\text{Saturation} = \frac{\text{difference}}{C_{max}} \times 100$$

$$= \frac{0.3}{0.6} \times 100\%$$

$$= 50\%$$

$$\text{Brightness} = C_{max} \times 100\% = 0.6 \times 100\%$$

$$= 60\%$$

So, Hue = 40°, Saturation = 50% and

Brightness = 60%

Problem-2

(a) We want to reflect the point (2, 1) about the line $y = x$.

For that, we have to the follow the following steps.

1) Rotate $(-\theta)$

2) Reflect about x-axis

3) Rotate (θ)

Here, as $y = x$.

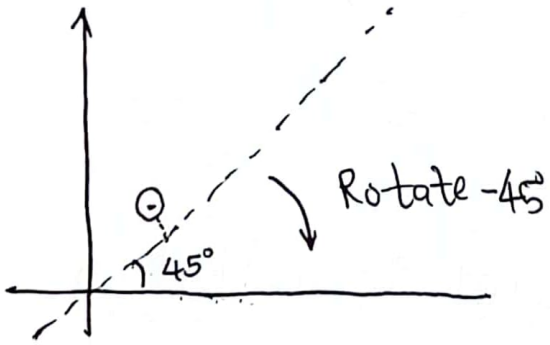
So, $\frac{y}{x} = 1$

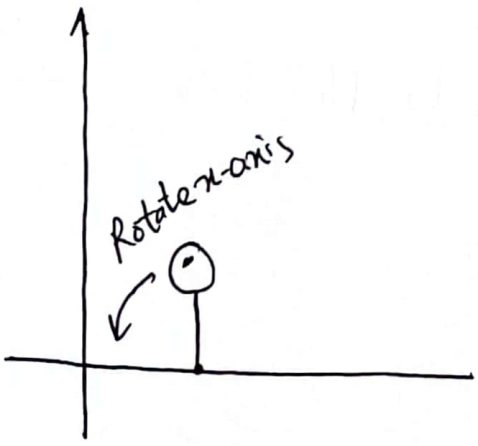
We know, $\tan\theta = \frac{y}{x}$

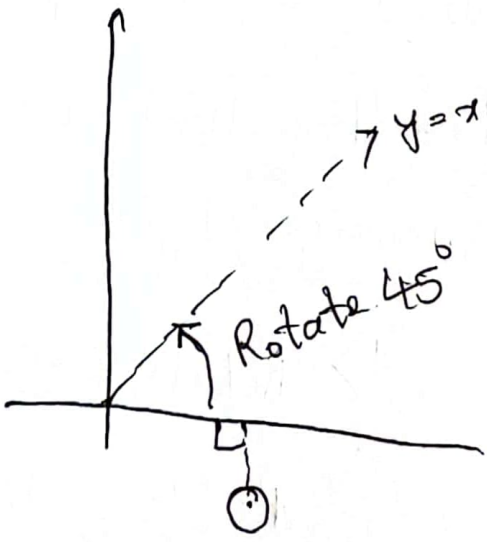
So, $\tan\theta = 1$

So, $\theta = 45^\circ$

And we dont need to translate because $y = x$ passes through origin.







So,
$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos 45 & (-\sin 45) & 0 \\ \sin 45 & \cos 45 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos(-45) & (\sin -45) & 0 \\ \sin(-45^\circ) & \cos -45^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos 45 & -\sin(45^\circ) & 0 \\ \sin 45 & \cos 45 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 2.1213 \\ -0.707 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos 45 & -\sin 45 & 0 \\ \sin 45 & \cos 45 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 2.1213 \\ 0.707 \\ 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

So, The reflected coordinates will be = (1,2)

(Ans)

(b) The steps are

(i) Rotate (-45°)

(ii) Reflect about x-axis

(iii) Rotate (45°)

(iv) Scale by (2x, 2y)

(v) Translate ~~(-1, -1)~~ (1, 1)

(vi) Rotate (90°)

(vii) Translate (-1, -1)

$$So, \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos 90^\circ & -\sin 90^\circ & 0 \\ \sin 90^\circ & \cos 90^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\times \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos 45^\circ & -\sin 45^\circ & 0 \\ \sin 45^\circ & \cos 45^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\times \begin{bmatrix} \cos -45^\circ & -\sin(-45^\circ) & 0 \\ \sin(-45^\circ) & \cos(-45^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} \leftarrow \text{Input}$$