Working with Technology

T1. Colors in print media, on computer monitors, and on television screens are implemented using what are called "color models". For example, in the RGB model, colors are created by mixing percentages of red (R), green (G), and blue (B), and in the YIQ model (used in TV broadcasting), colors are created by mixing percentages of luminescence (Y) with percentages of a chrominance factor (I) and a chrominance factor (Q). The conversion from the RGB model to the YIQ model is accomplished by the matrix equation

$$\begin{bmatrix} Y \\ I \\ Q \end{bmatrix} = \begin{bmatrix} .299 & .587 & .114 \\ .596 & -.275 & -.321 \\ .212 & -.523 & .311 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

What matrix would you use to convert the YIQ model to the RGB model?

Mencari matriks invers menggunakan gauss Jordan atau OBE

0,299	0,587	0,114	1	0	0
0,596	-0,275	-0,321	0	1	0
0,212	-0,523	0,311	0	0	1
Iterasi 1	b1 = b1 / 0,299				
1	1,96321	0,38127	3,34448	0	0
0,596	-0,275	-0,321	0	1	0
0,212	-0,523	0,311	0	0	1
Iterasi 2	b2 = b1 * (-0,596) + b2				
1	1,96321	0,38127	3,34448	0	0
0	-1,44507	-0,54824	-1,99331	1	0
0,212	-0,523	0,311	0	0	1
Iterasi 3	b3 = b1 * (-0,212) + b3				
1	1,96321	0,38127	3,34448	0	0
0	-1,44507	-0,54824	-1,99331	1	0
0	-0,9392	0,23017	-0,70903	0	1

Iterasi 4	b2 = b2 / (-1,44507)				
1	1,96321	0,38127	3,34448	0	0
0	1	0,37939	1,37939	-0,69201	0
0	-0,9392	0,23017	-0,70903	0	1
Iterasi 5	b3 = b2 * 0,9392 + b3				
1	1,96321	0,38127	3,34448	0	0
0	1	0,37939	1,37939	-0,69201	0
0	0	0,58649	0,58649	-0,64993	1
Iterasi 6	b3 = b3 / 0,58649				
1	1,96321	0,38127	3,34448	0	0
0	1	0,37939	1,37939	-0,69201	0
0	0	1	1	-1,10817	1,70506

Iterasi 7	b2 = b3 * (-0,37939) + b2				
1	1,96321	0,38127	3,34448	0	0
0	1	0	1	-0,27158	-0,64688
0	0	1	1	-1,10817	1,70506
Iterasi 8	b1 = b3 * (-0,38127) + b1				
1	1,96321	0	2,96321	0,42251	-0,65009
0	1	0	1	-0,27158	-0,64688
0	0	1	1	-1,10817	1,70506
Iterasi 9	b1 = b2 * (-1,96321) + b1				
1	0	0	1	0,95568	0,61987
0	1	0	1	-0,27158	-0,64688
0	0	1	1	-1,10817	1,70506

T2. Let

$$A = \begin{bmatrix} 1 & -2 & 2 \\ 4 & 5 & 1 \\ 0 & 3 & -1 \end{bmatrix}, \quad B_1 = \begin{bmatrix} 0 \\ 1 \\ 7 \end{bmatrix}, \quad B_2 = \begin{bmatrix} 11 \\ 5 \\ 3 \end{bmatrix}, \quad B_3 = \begin{bmatrix} 1 \\ -4 \\ 2 \end{bmatrix}$$

Solve the linear systems $A\mathbf{x} = B_1$, $A\mathbf{x} = B_2$, $A\mathbf{x} = B_3$ using the method of Example 2.

▶ **EXAMPLE 2 Solving Two Linear Systems at Once**

Solve the systems

(a) $\begin{aligned} x_1 + 2x_2 + 3x_3 &= 4 \\ 2x_1 + 5x_2 + 3x_3 &= 5 \\ x_1 \qquad + 8x_3 &= 9 \end{aligned}$ (b) $\begin{aligned} x_1 + 2x_2 + 3x_3 &= 1 \\ 2x_1 + 5x_2 + 3x_3 &= 6 \\ x_1 \qquad + 8x_3 &= -6 \end{aligned}$

Solution The two systems have the same coefficient matrix. If we augment this coefficient matrix with the columns of constants on the right sides of these systems, we obtain

$$\left[\begin{array}{ccc|c|c} 1 & 2 & 3 & 4 & 1 \\ 2 & 5 & 3 & 5 & 6 \\ 1 & 0 & 8 & 9 & -6 \end{array}\right]$$

Reducing this matrix to reduced row echelon form yields (verify)

$$\left[\begin{array}{ccc|c|c} 1 & 0 & 0 & 1 & 2 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & -1 \end{array}\right]$$

It follows from the last two columns that the solution of system (a) is $x_1 = 1$, $x_2 = 0$, $x_3 = 1$ and the solution of system (b) is $x_1 = 2$, $x_2 = 1$, $x_3 = -1$. ◀

1	-2	2	0	11	1
4	5	1	1	5	-4
0	3	-1	7	3	2
Iterasi 1	b2 = b1 * (-4) + b2				
1	-2	2	0	11	1
0	13	-7	1	-39	-8
0	3	-1	7	3	2
Iterasi 2	b2 = b2 / 13				
1	-2	2	0	11	1
0	1	-0,53846	0,07692	-3	-0,61538
0	3	-1	7	3	2
Iterasi 3	b3 = b2 * (-3) + b3				
1	-2	2	0	11	1
0	1	-0,53846	0,07692	-3	-0,61538
0	0	0,61538	6,76923	12	3,84615
Iterasi 4	b3 = b3 / 0,61538				
1	-2	2	0	11	1
0	1	-0,53846	0,07692	-3	-0,61538
0	0	1	11,0001	19,5001	6,25004
Iterasi 5	b2 = b3 * 0,53846 + b2				
1	-2	2	0	11	1
0	1	0	6,00002	7,50005	2,75002
0	0	1	11,0001	19,5001	6,25004
Iterasi 6	b1 = b3 * (-2) + b1				
1	-2	0	-22,0002	-28,0003	-11,5001
0	1	0	6,00002	7,50005	2,75002
0	0	1	11,0001	19,5001	6,25004
Iterasi 7	b1 = b2 * 2 + b1				
1	0	0	-10,0002	-13,0002	-6,00006
0	1	0	6,00002	7,50005	2,75002
0	0	1	11,0001	19,5001	6,25004
			B1	B2	B3