

Sean Poston

CS245 Exam 2 Work

4/4/2020

Exam 2 CS245 Sean Poston

12) $A = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$ $\begin{cases} 2a + 3b = 4 \\ 3a + 5b = 1 \end{cases}$ $\begin{cases} 2c + 3d = 5 \\ 3c + 5d = 2 \end{cases}$

$2a + 3b = 4$
 $2a = 4 - 3b$
 $a = \frac{4 - 3b}{2}$

$3\left(\frac{4 - 3b}{2}\right) + 5b = 1$
 $\frac{12 - 9b}{2} + 5b = 1$
 $12 - 9b + 10b = 2$
 $12 + b = 2$
 $-10 = b$

$2a + 3(-10) = 4$
 $2a - 30 = 4$
 $2a = 34$
 $a = 17$

$2c + 3d = 5$
 $2c = 5 - 3d$
 $c = \frac{5 - 3d}{2}$

$3\left(\frac{5 - 3d}{2}\right) + 5d = 2$
 $\frac{15 - 9d}{2} + 5d = 2$
 $15 - 9d + 10d = 4$
 $15 + d = 4$
 $d = -11$

$2c + 3(-11) = 5$
 $2c - 33 = 5$
 $2c = 38$
 $c = 19$

$\begin{bmatrix} 17 & 19 \\ -10 & -11 \end{bmatrix} = A$

Check:

$\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 17 & 19 \\ -10 & -11 \end{bmatrix} = \begin{bmatrix} 2(17) + 3(-10) & 2(19) + 3(-11) \\ 3(17) + 5(-10) & 3(19) + 5(-11) \end{bmatrix}$
 $\begin{bmatrix} 34 - 30 & 38 - 33 \\ 51 - 50 & 57 - 55 \end{bmatrix}$
 $\begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix}$

Check

$\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 17 & 19 \\ -10 & -11 \end{bmatrix} = \begin{bmatrix} 34 - 30 & 38 - 33 \\ 51 - 50 & 57 - 55 \end{bmatrix}$
 \downarrow
 $\begin{bmatrix} 4 & 5 \\ 1 & 2 \end{bmatrix} \checkmark$

Start
 ↓
 2.) $7, 4, 1, 3, 5, 2, 6$
 - is $4 < 7$? yes, swap with 7
 $4, 7, 1, 3, 5, 2, 6$
 - is 1 smaller than 7? swap; is $1 < 4$? yes, swap
 $1, 4, 7, 3, 5, 2, 6$
 - is $3 < 7$? yes, swap; is $3 < 4$? yes, swap; is $3 < 1$? no
 $1, 3, 4, 7, 5, 2, 6$
 - is 5 smaller than 7? yes, swap; is $5 < 4$? no.
 $1, 3, 4, 5, 7, 2, 6$
 - is $2 < 7$? yes; is $2 < 5$? yes; is $2 < 4$? yes; is $2 < 3$? yes; is $2 < 1$? no
 $1, 2, 3, 4, 5, 7, 6$
 - is $6 < 7$? yes, swap; is $6 < 5$? no.
 $1, 2, 3, 4, 5, 6, 7$
 - end.

3.) $8, 6 \log n, 9n, 2n \log n, 3n^2, 2n^3, 5^n, 7^n, (4n!)^2$

$$4(100!)^2 = 1$$

$$5^{100} = 3$$

$$7^{100} = 2$$

4.) a.) $O(n^2)$

b.) 3^n

c.) $2n$