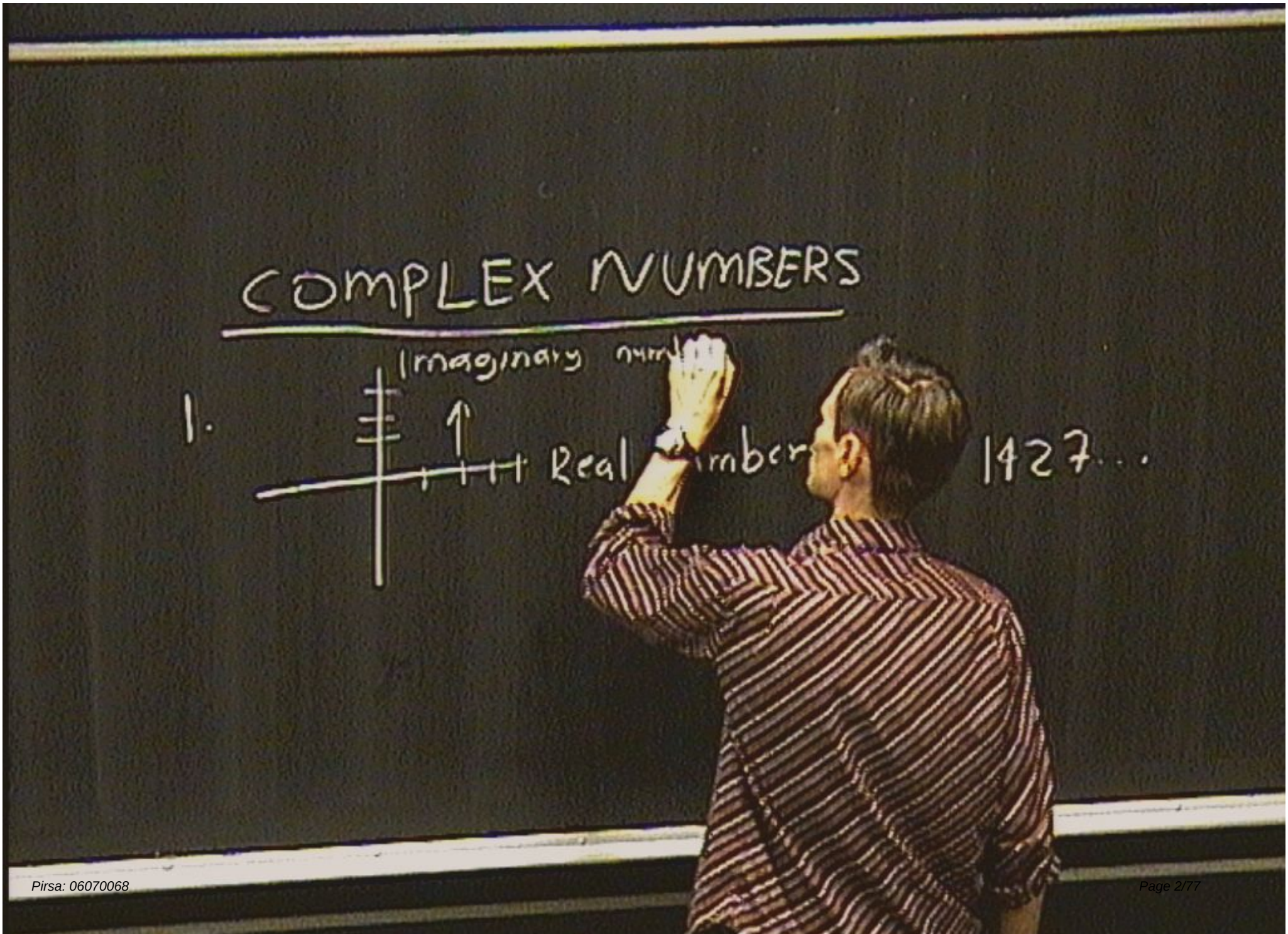
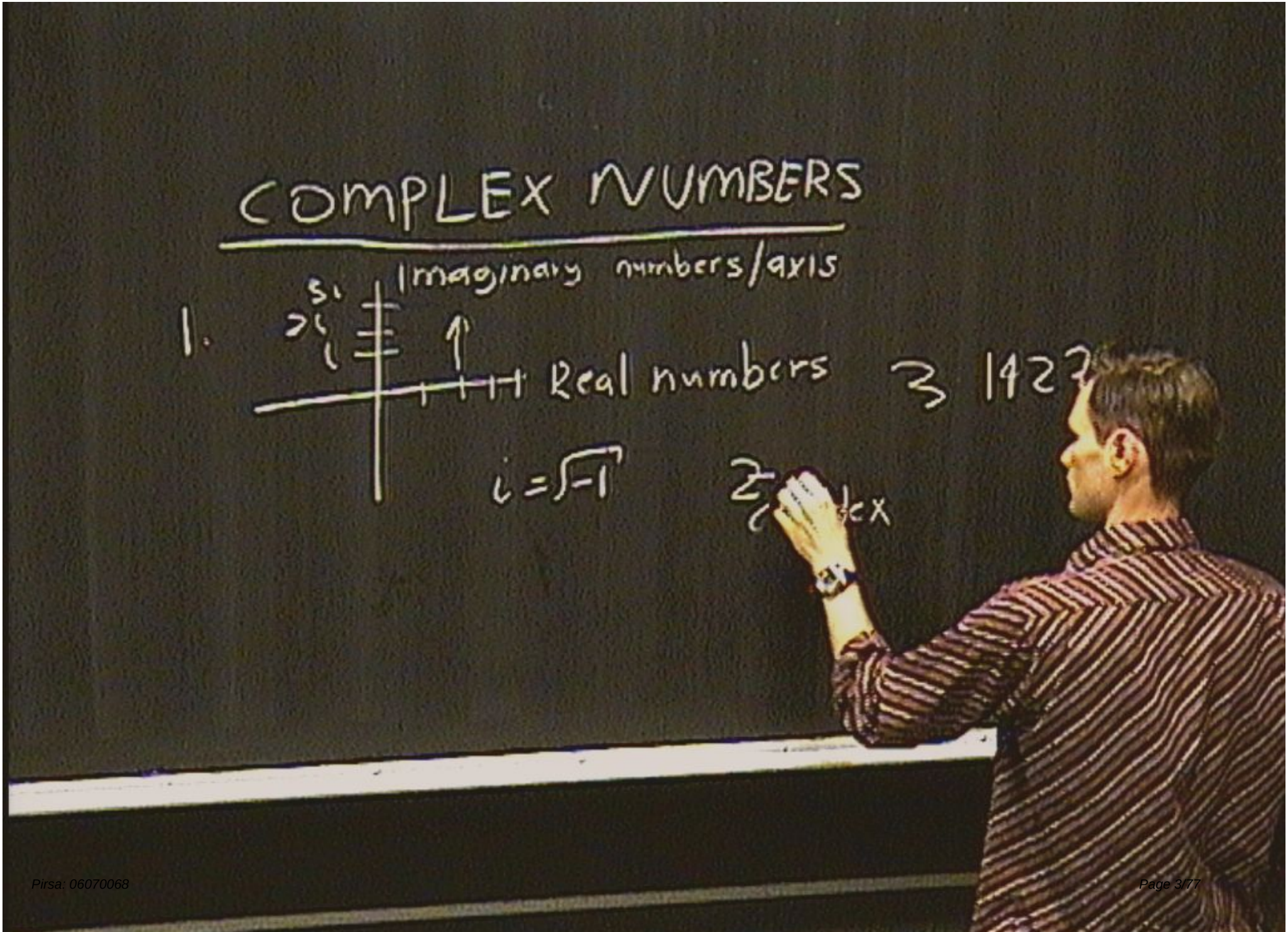
Title: Math Primer: Matrices

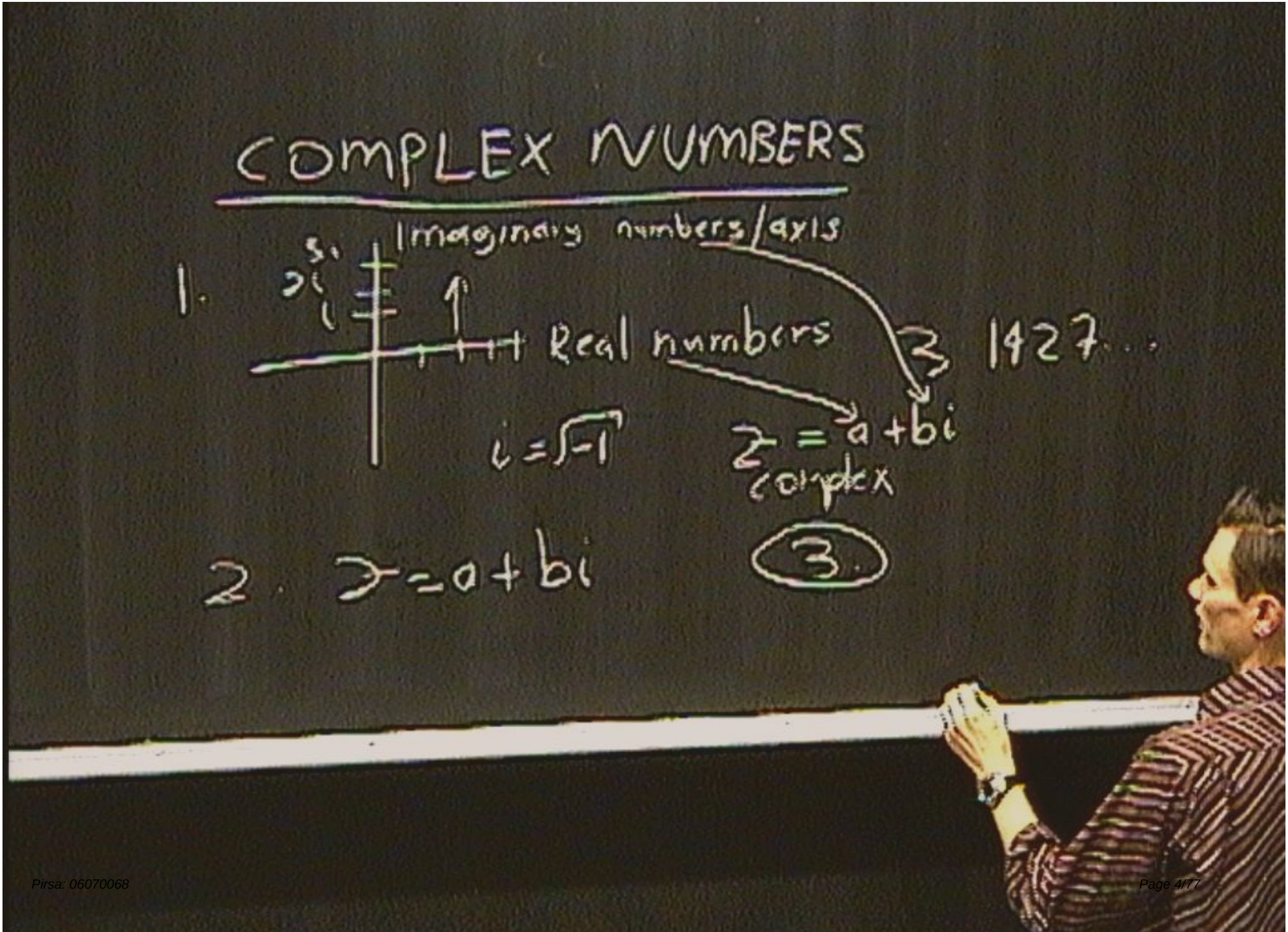
Date: Jul 25, 2006 09:00 AM

URL: http://pirsa.org/06070068

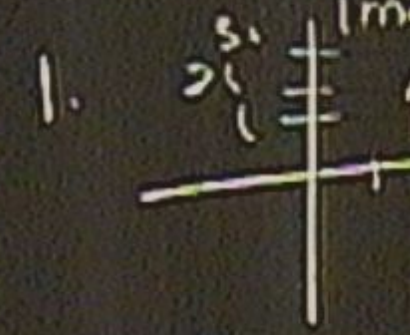
Abstract:


COMPLEX NUMBERS
Imaginary
1.
Real
1427...


COMPLEX NUMBERS
Imaginary numbers/axis
1.
Real numbers
3.1427
$i = \sqrt{-1}$


COMPLEX NUMBERS
Imaginary numbers/axis
1.
2i
i
Real numbers
3. 1427...
i = √-1
z = a + bi
z complex
2. z = a + bi
3.

COMPLEX NUMBERS

1. 

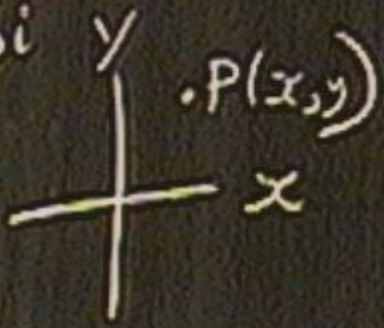
$i = \sqrt{-1}$

3 1127...

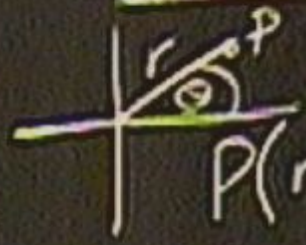
$z = a + bi$ complex

2. $z = a + bi$

(3)

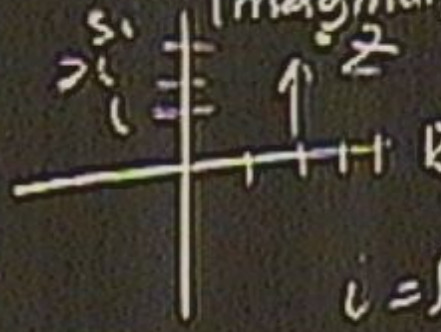


polar co-ordinates



COMPLEX NUMBERS

Imaginary numbers/axis

1. 

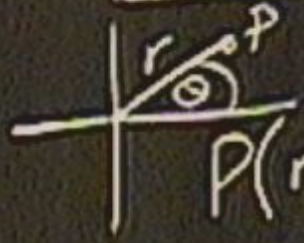
$i = \sqrt{-1}$

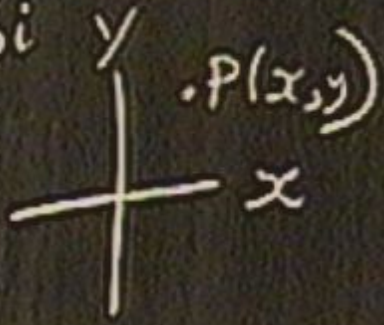
$Z = a + bi$ (complex)

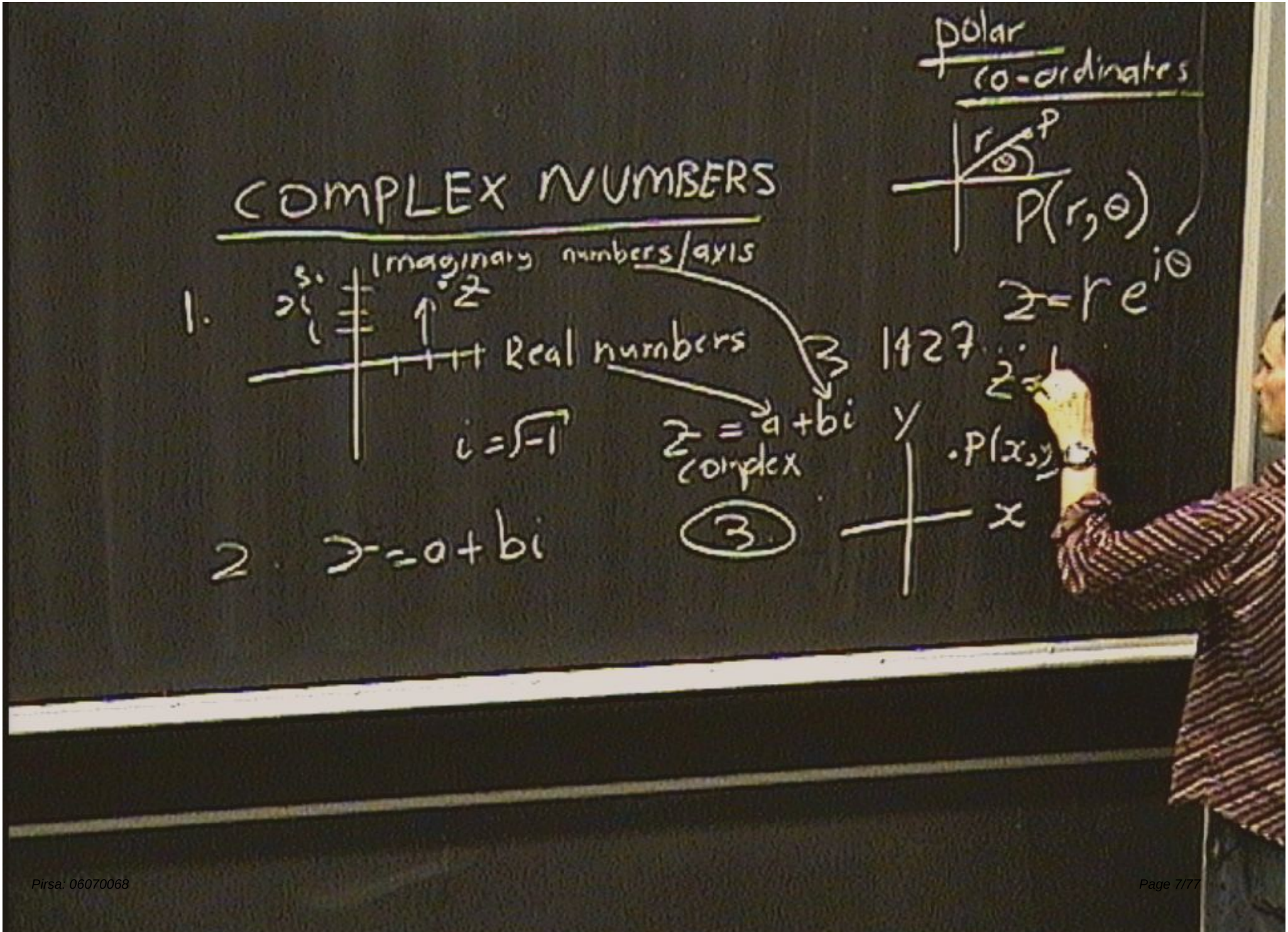
2. $Z = a + bi$

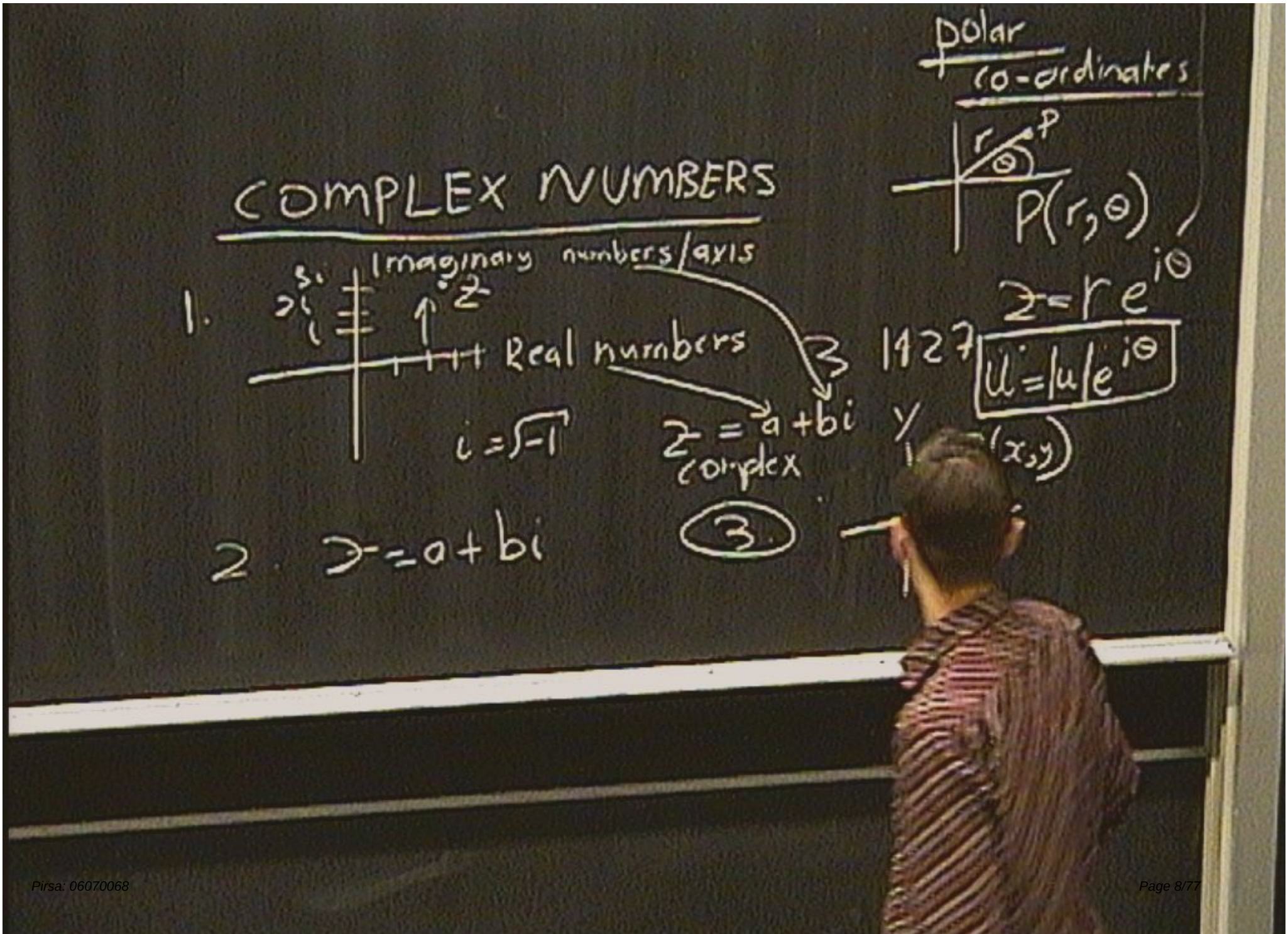
3. 1427...

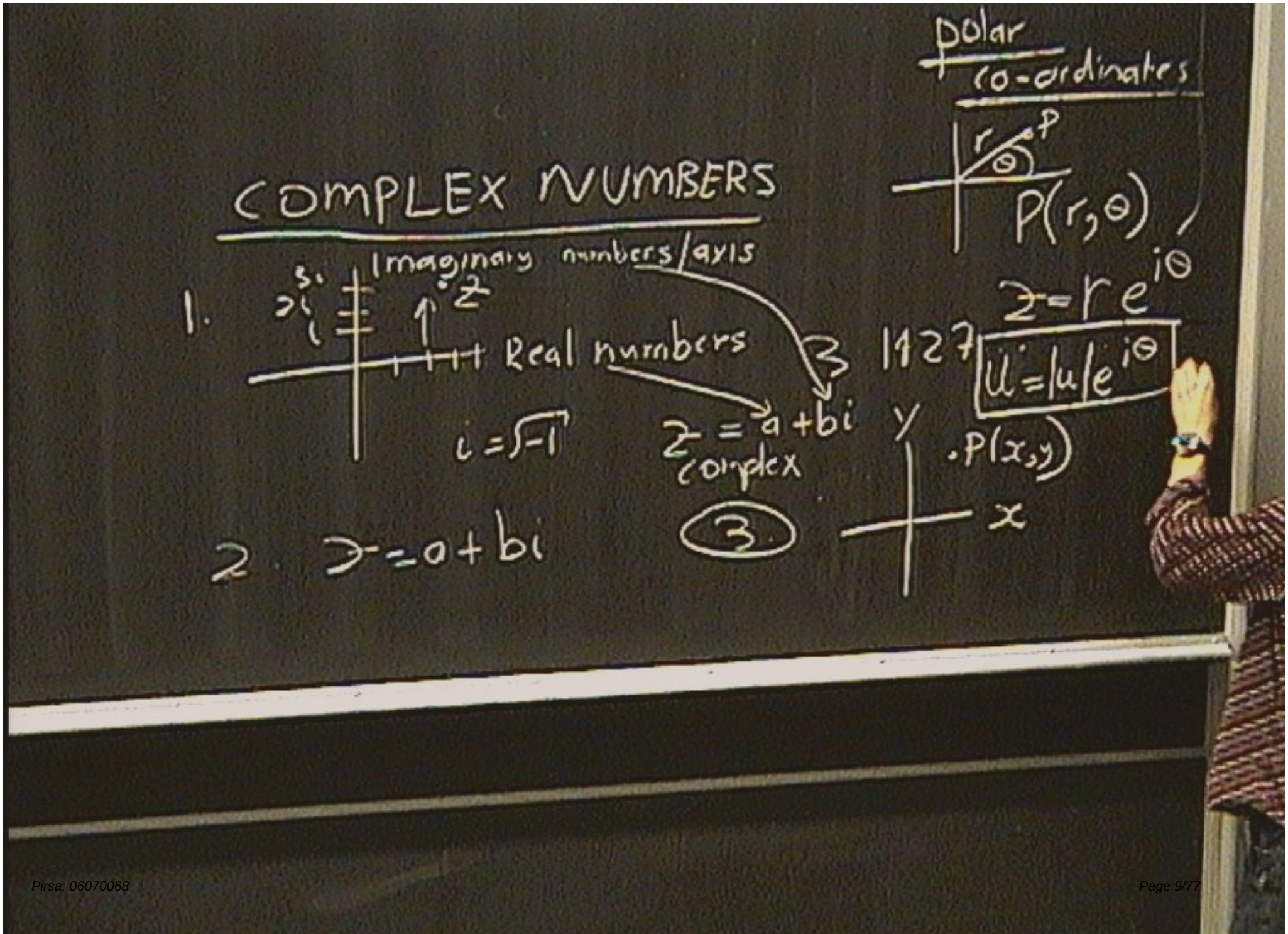
polar co-ordinates






COMPLEX NUMBERS
Imaginary numbers/axis
1.
3i
2i
i
z
Real numbers
3
i = √-1
z = a + bi
z complex
2. z = a + bi
polar co-ordinates
r
θ
P
P(r, θ)
z = re^iθ
1427...
z =
y
P(x, y)
x
3


COMPLEX NUMBERS
Imaginary numbers/axis
1.
3i
2i
i
Z
Real numbers
3
$i = \sqrt{-1}$
$Z = a + bi$
complex
2. $Z = a + bi$
Polar co-ordinates
r
θ
P
P(r, θ)
$Z = re^{i\theta}$
1427
$u = |u| e^{i\theta}$
y
(x, y)
3


COMPLEX NUMBERS
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1.
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$i = \sqrt{-1}$
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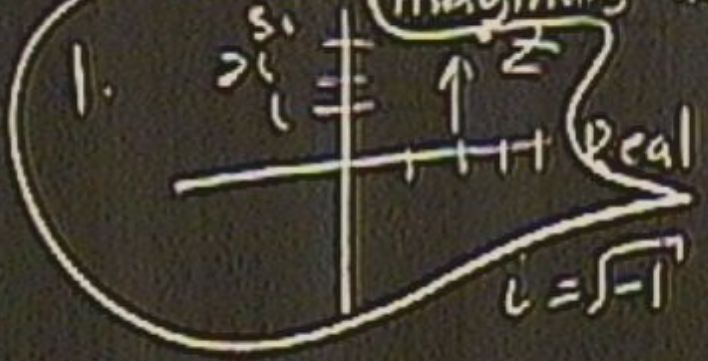
complex
2. $z = a + bi$
Polar co-ordinates
r
θ
P
P(r, θ)
$z = re^{i\theta}$
1127
$u = |u|e^{i\theta}$
y
P(x, y)
x

COMPLEX NUMBERS

1. imaginary numbers / axis



$i = \sqrt{-1}$

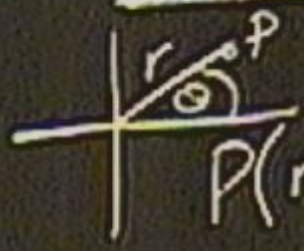
2. $z = a + bi$

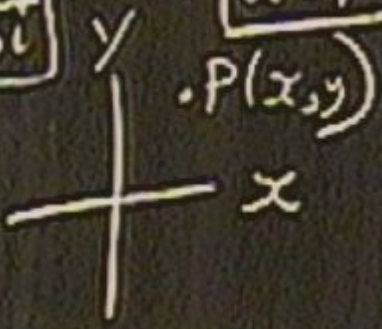
3. $z = a + bi$ (complex)

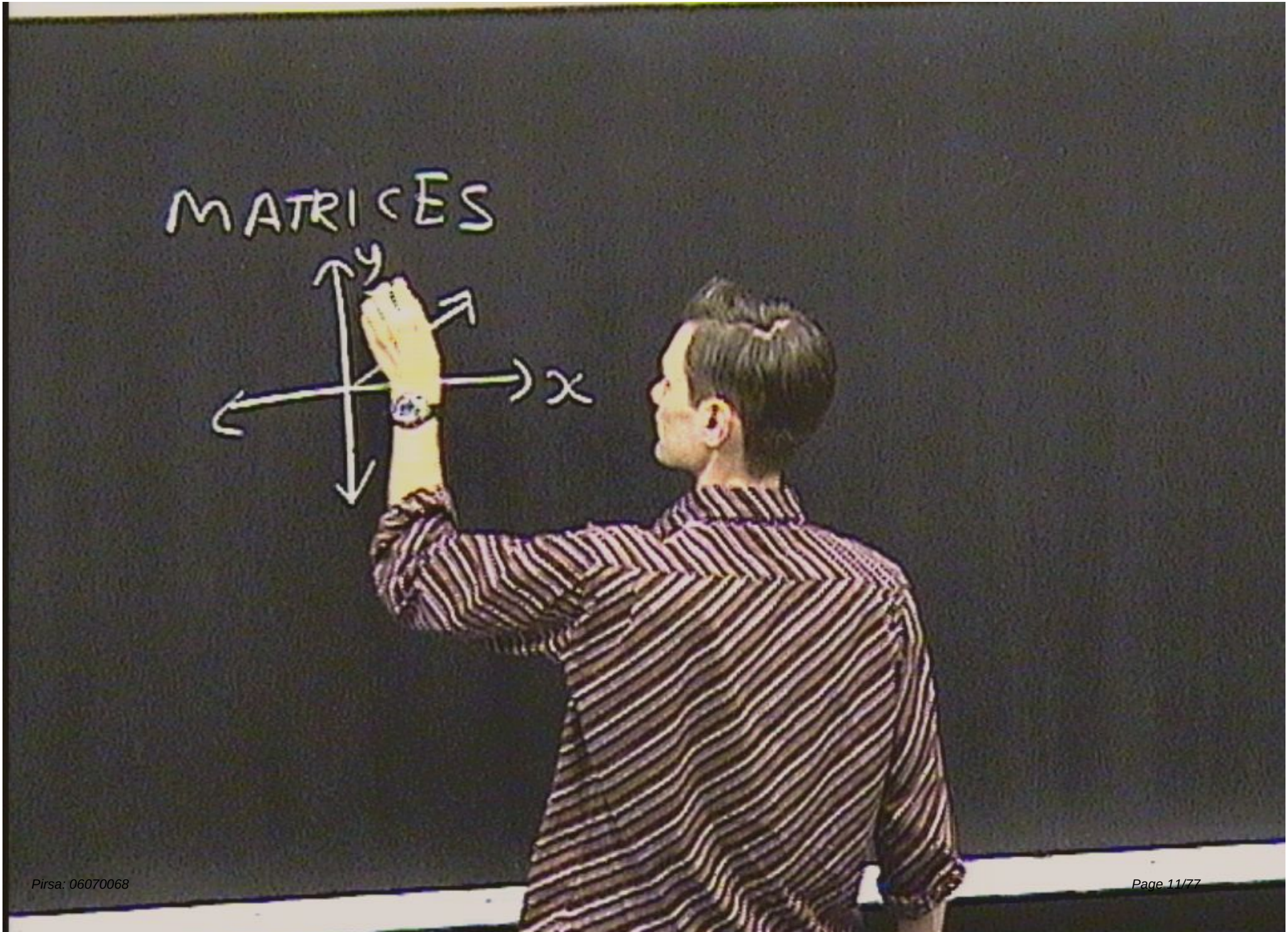
1127 $w = |w| e^{i\theta}$ *

$z = re^{i\theta}$

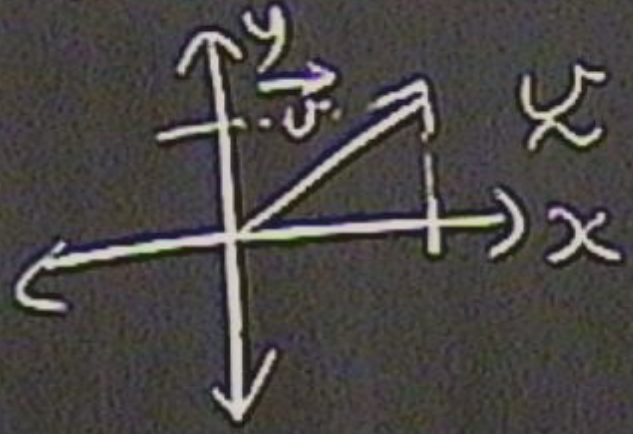
polar co-ordinates



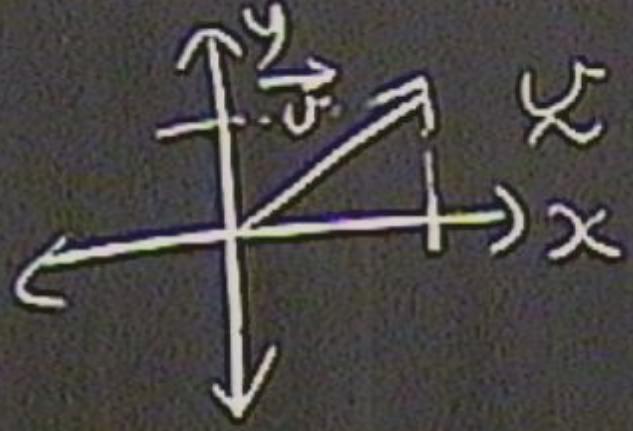



MATRICES
y
x

MATRICES

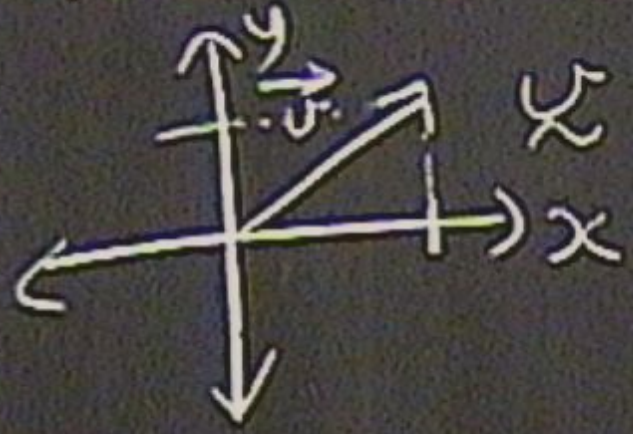


MATRICES



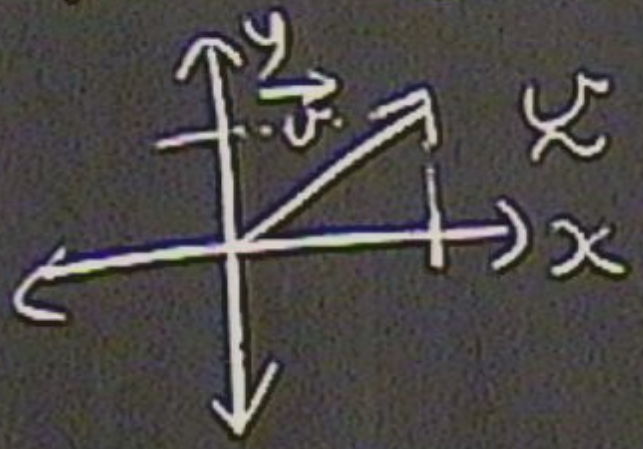
$$\vec{v} = \begin{pmatrix} x \\ y \end{pmatrix} = \left[\right.$$

MATRICES



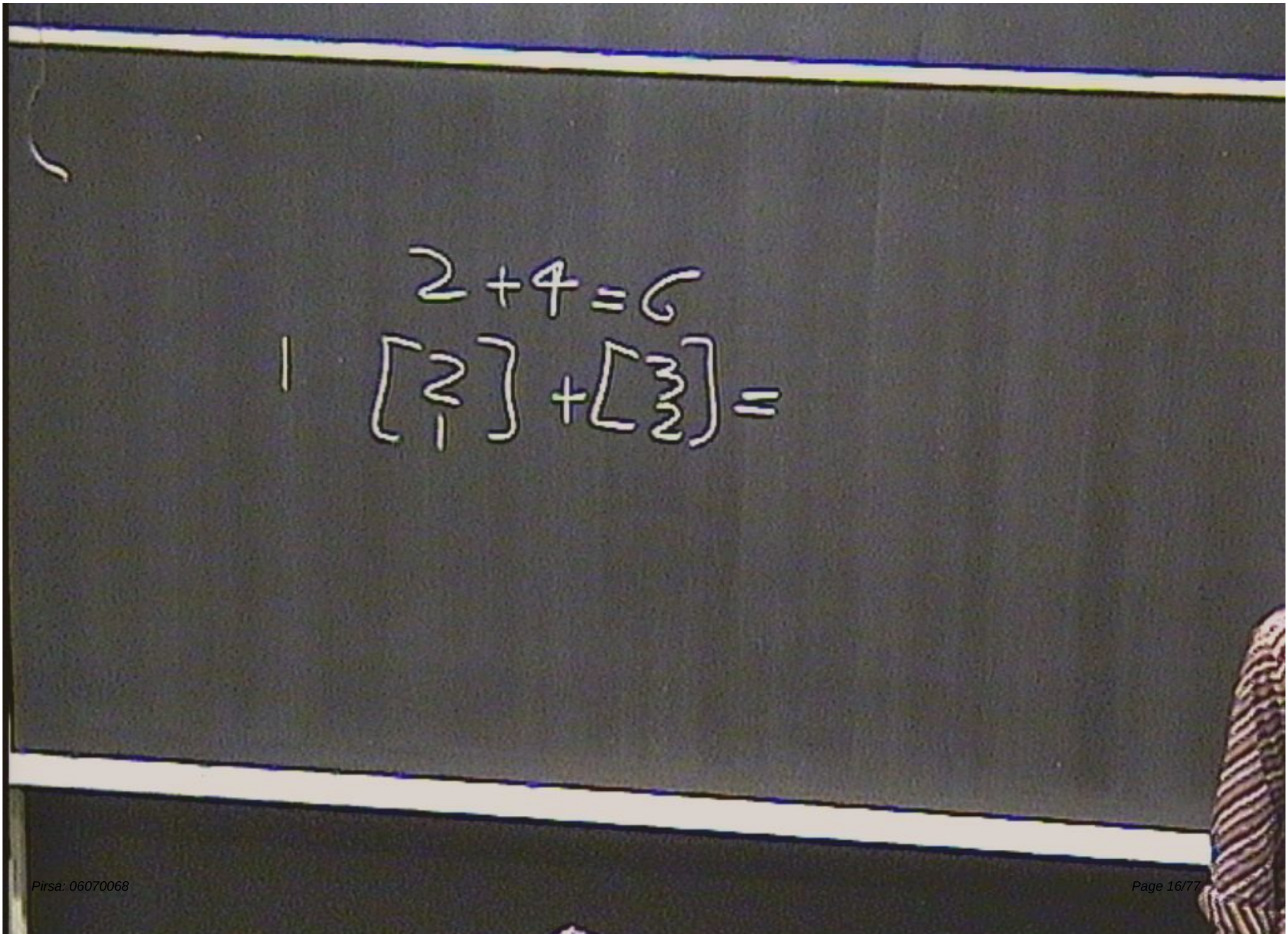
$$\vec{v} = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

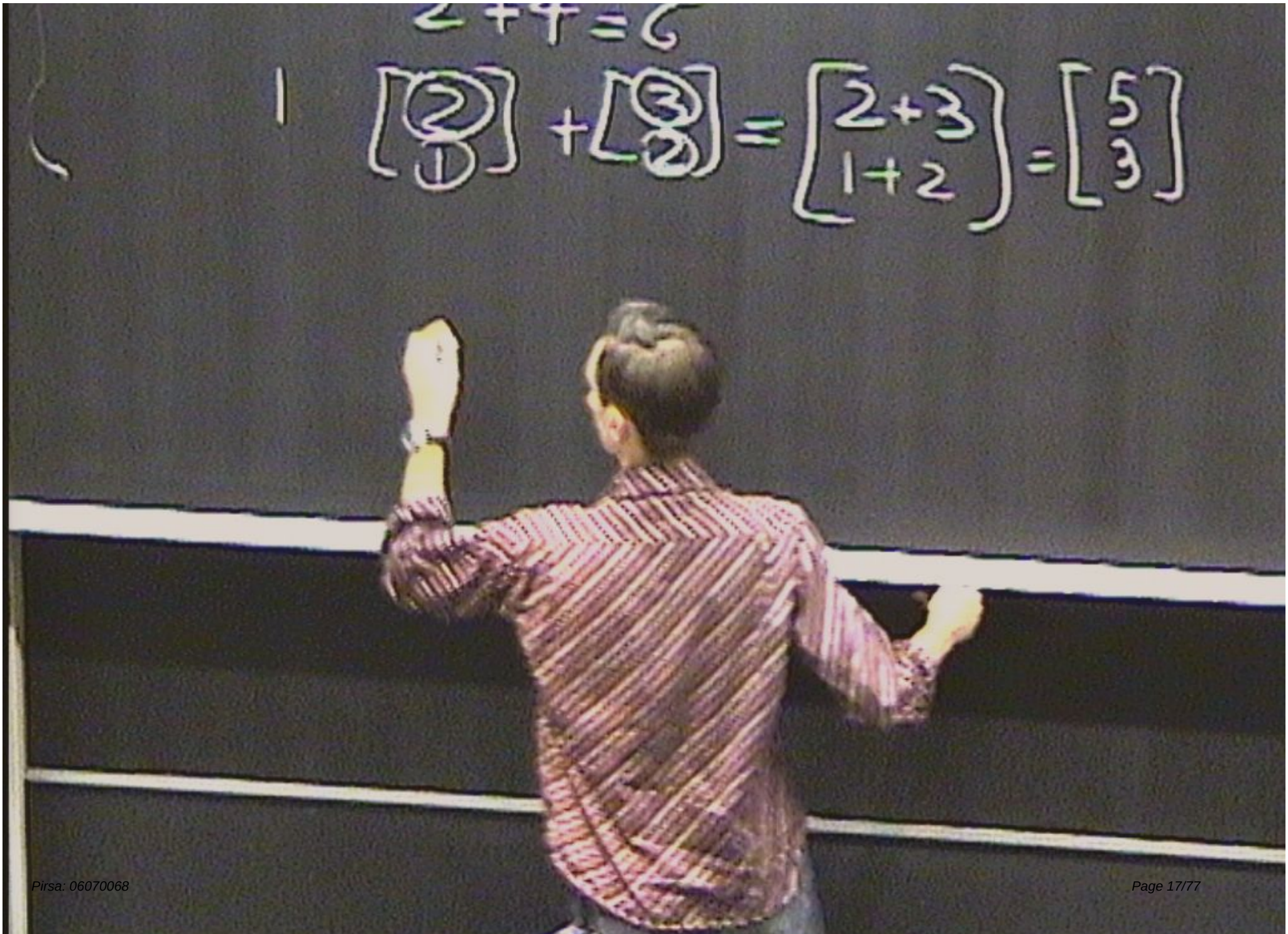
MATRICES



$$\vec{v} = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

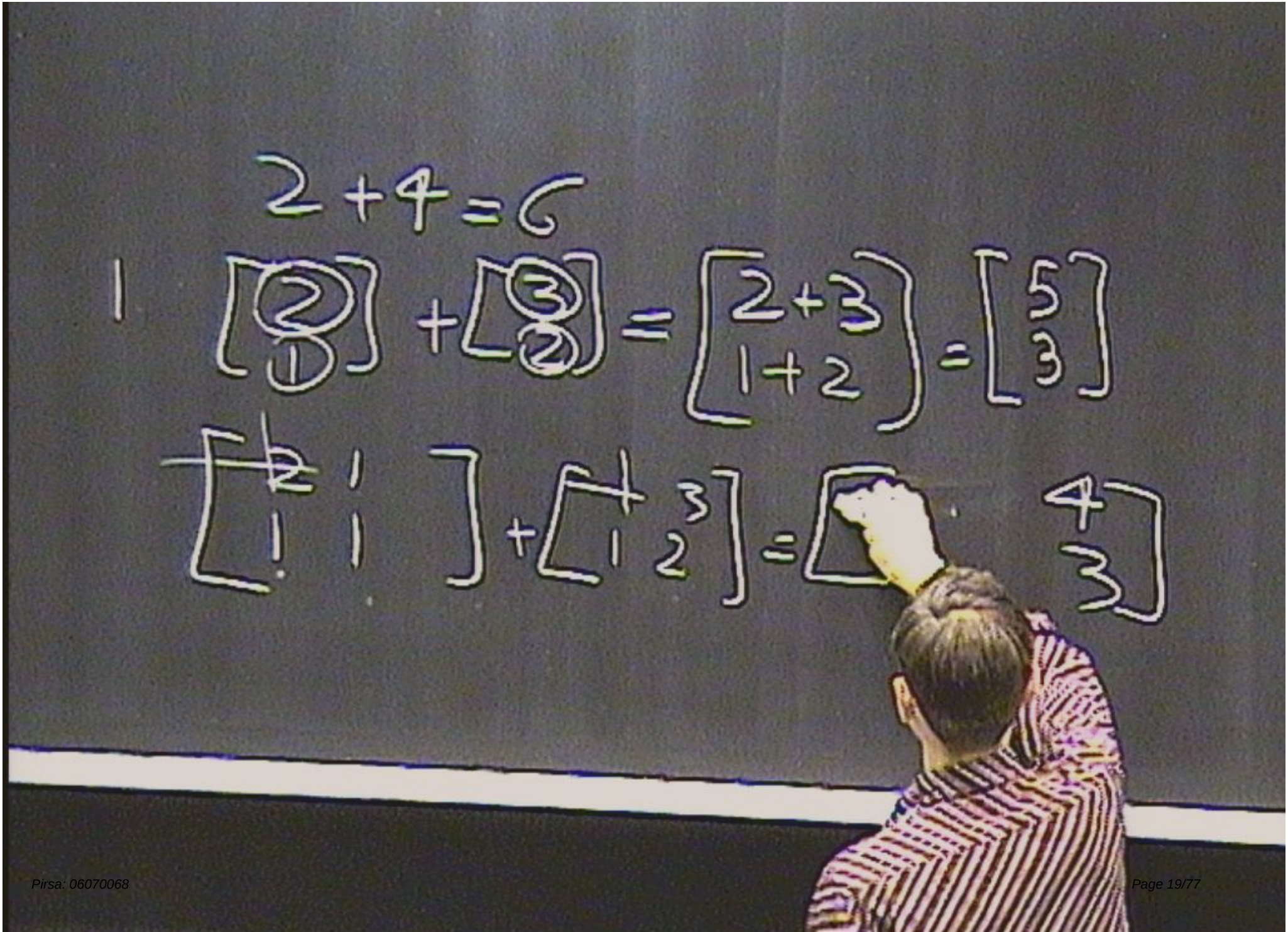

2+4=6
1 [2/1] + [3/2] =

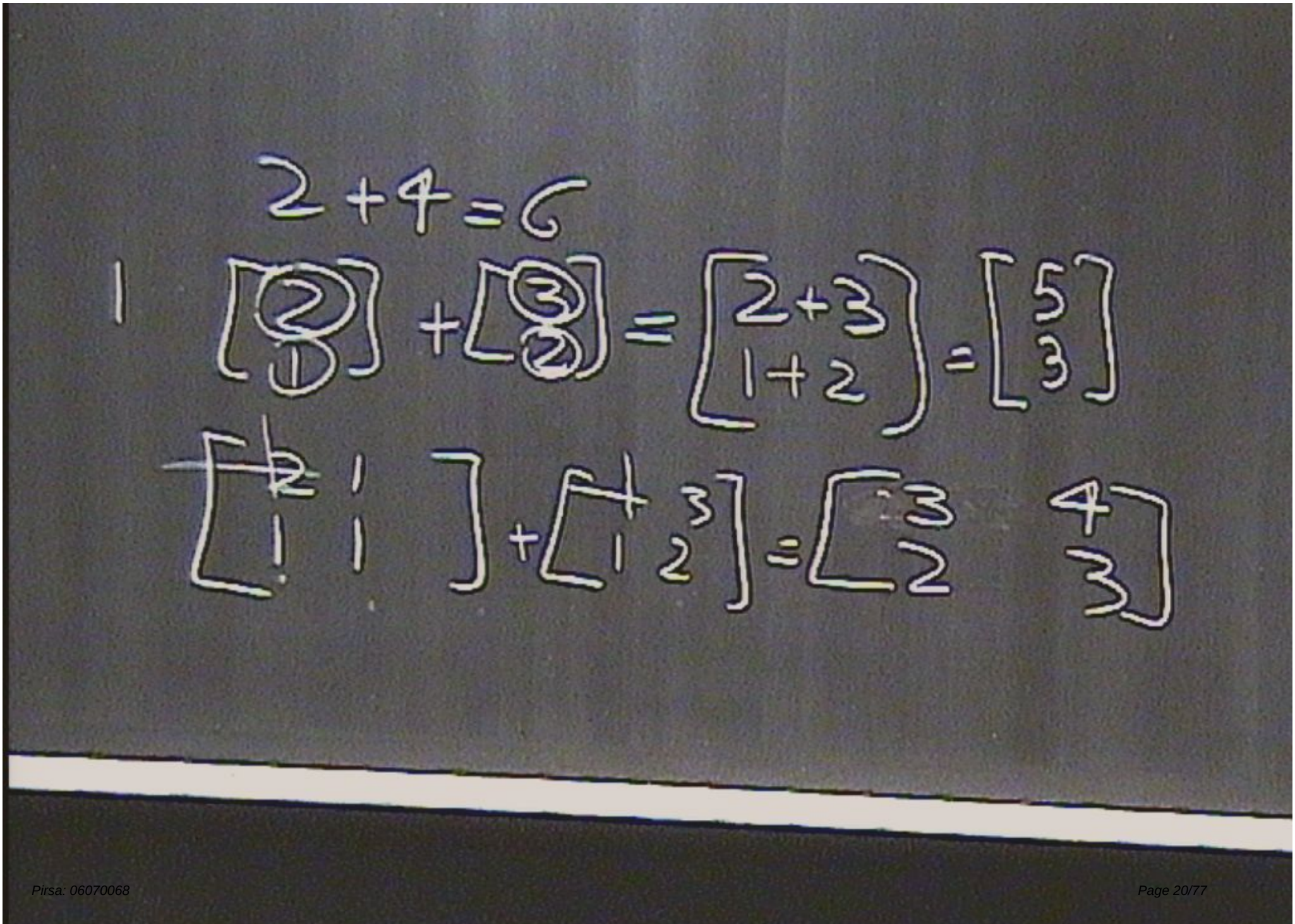

2+4=6
1 [2 1] + [3 2] = [2+3 1+2] = [5 3]

$2+4=6$

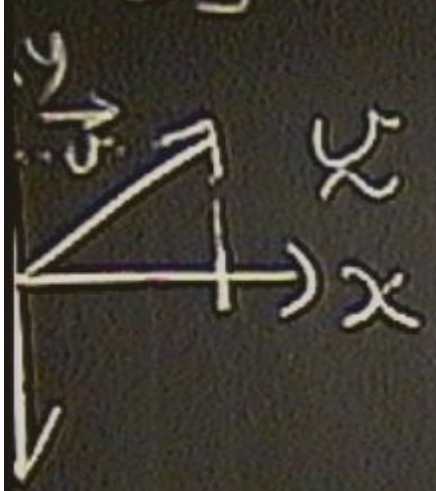
1 $\begin{bmatrix} 2 \\ 1 \end{bmatrix} + \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 2+3 \\ 1+2 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$

$\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 3 \\ 1 & 2 \end{bmatrix} =$


2 + 4 = 6
1
[2] + [3] = [2+3] = [5]
[1] [2] [1] [3]
[1 1] + [1 2] = [4]
[3]

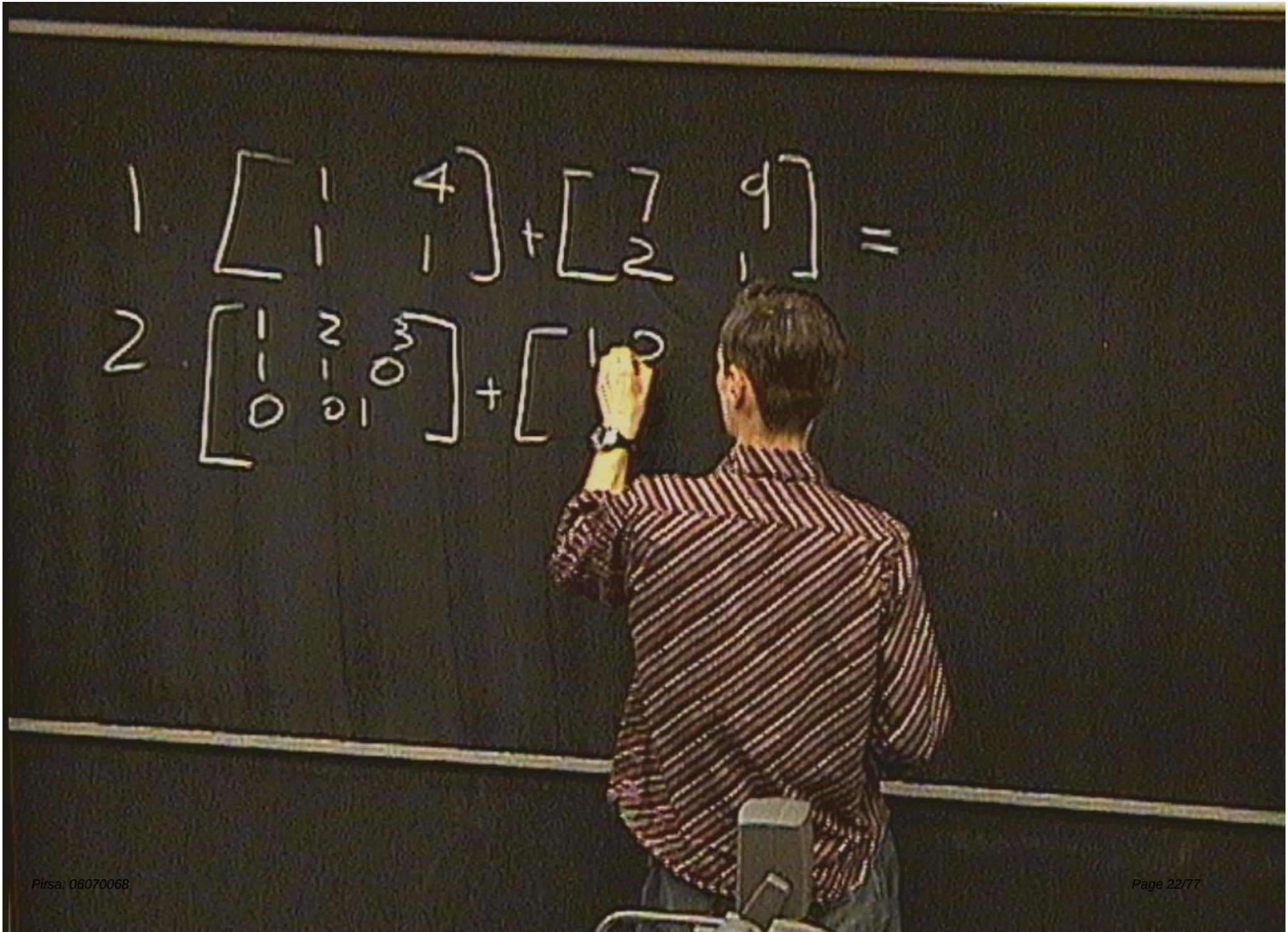

2+4=6
1 [2] + [3] = [2+3] = [5]
[1] [2] [1+2] [3]
[1 1] + [1 2] = [2 3] [3 4]

ICES



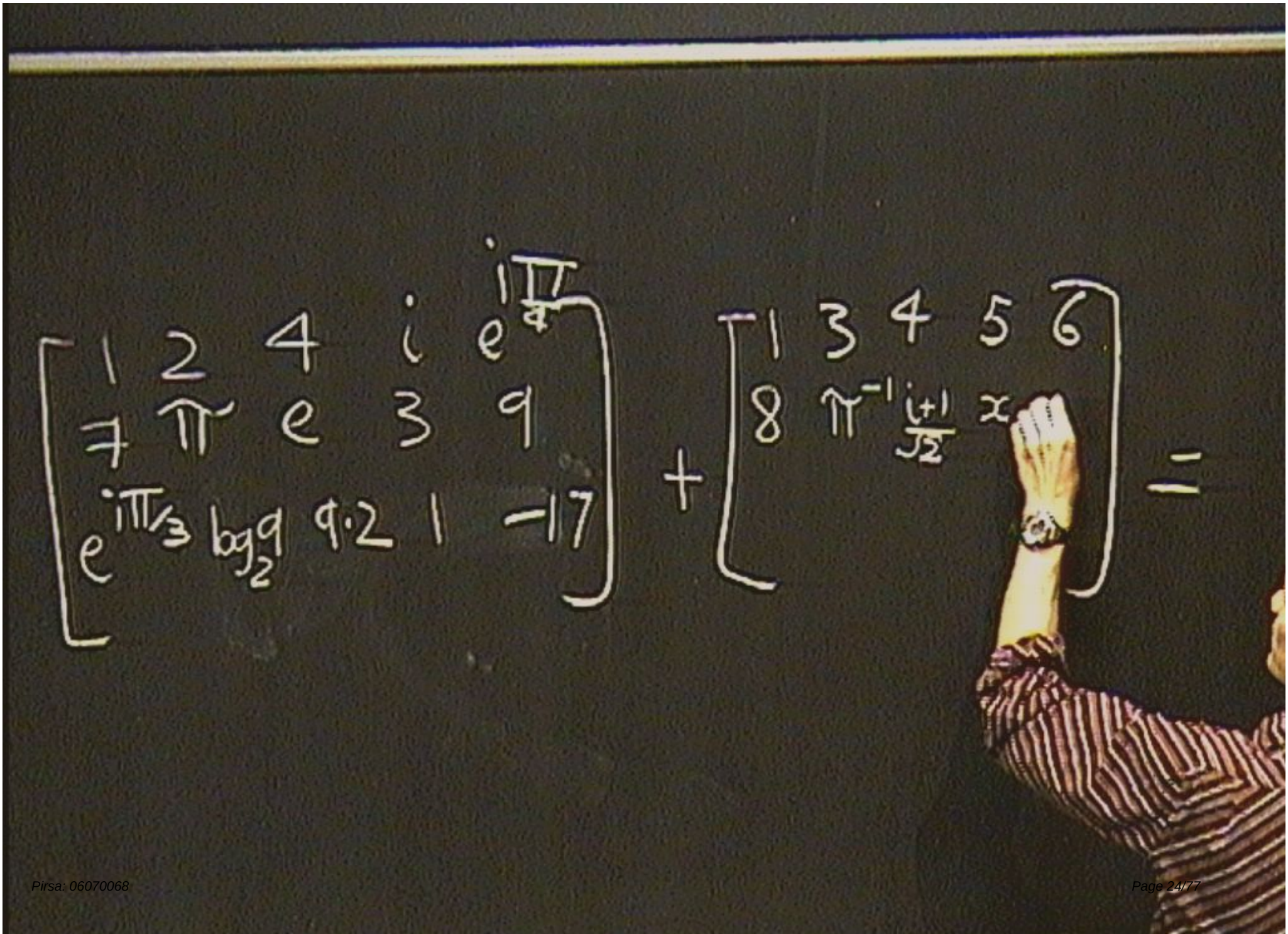
$$\vec{v} = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$ 2 x 2 matrix

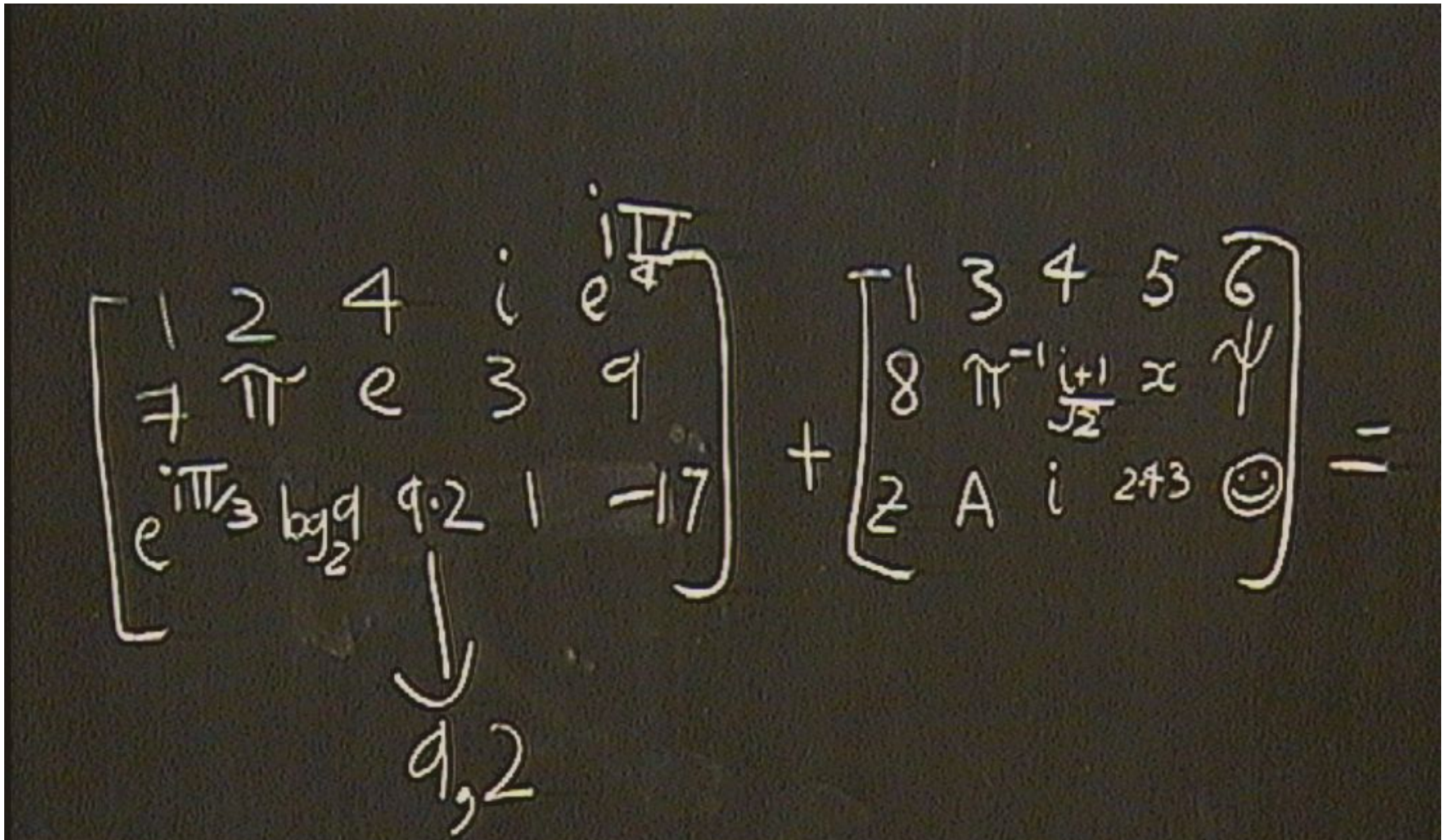

1 [1 4 / 1 1] + [7 9 / 2 1] =
2 [1 2 3 / 1 1 0 / 0 0 1] + [1 2

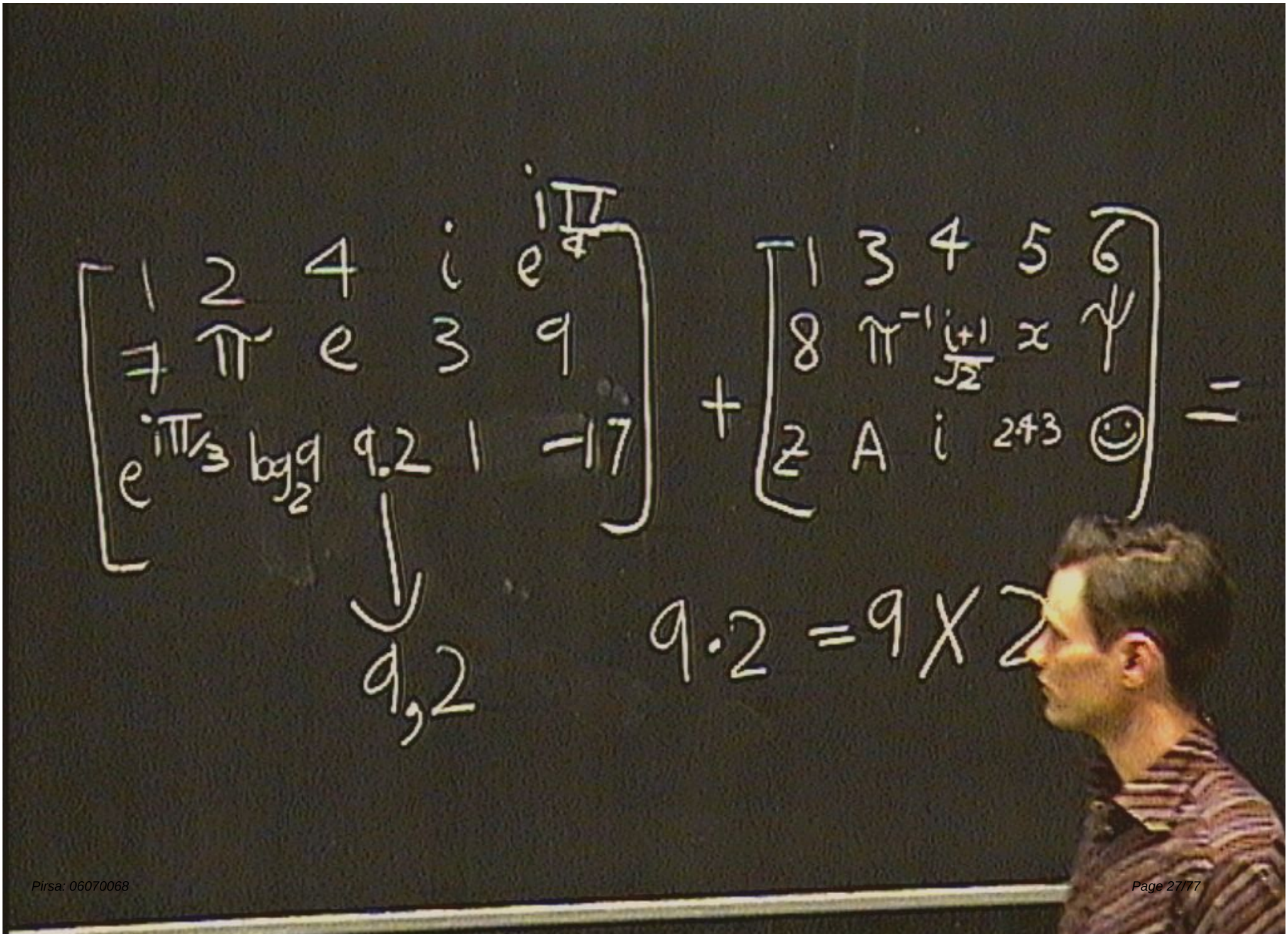
1. $\begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 7 & 9 \\ 2 & 1 \end{bmatrix} =$

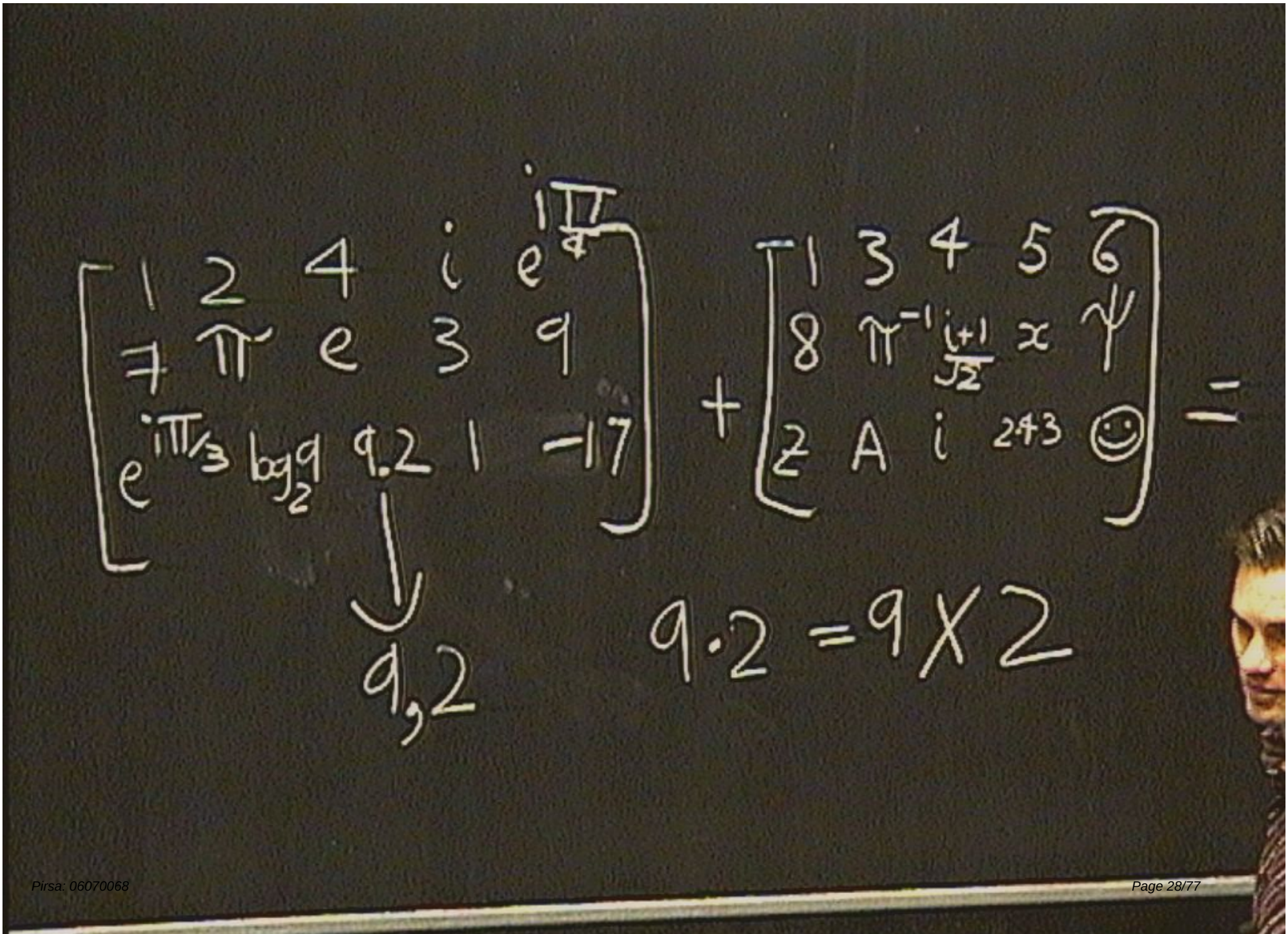
2. $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 0 \\ 0 & 01 & \end{bmatrix} + \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 1 & 3 & 1 \end{bmatrix} =$

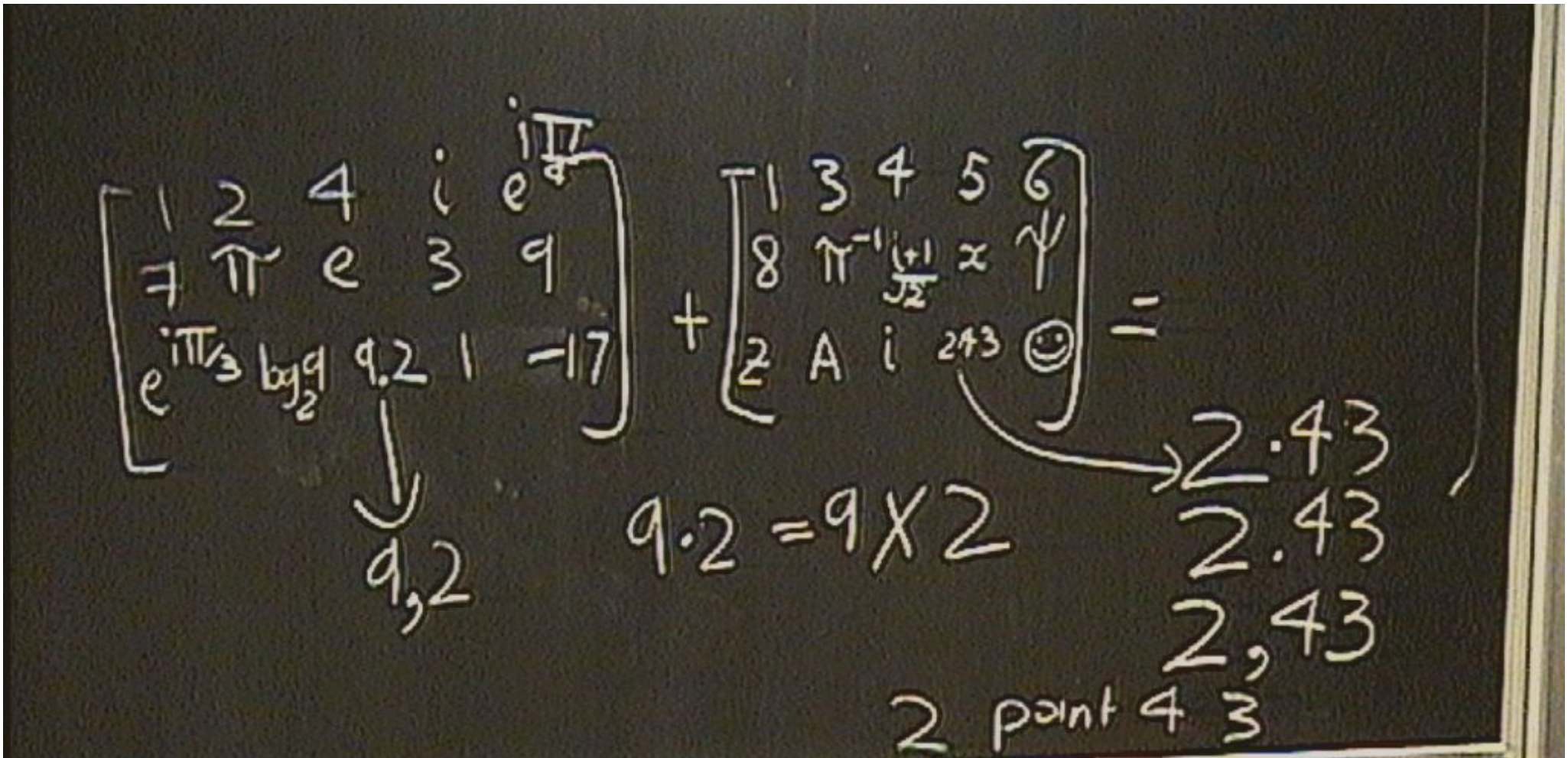

$\begin{bmatrix} 1 & 2 & 4 & i & e^{\frac{i\pi}{4}} \\ 7 & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9.2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} 1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \end{bmatrix} =$

$$\begin{bmatrix} 1 & 2 & 4 & i & e^{i\frac{\pi}{4}} \\ 7 & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9.2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} -1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \gamma \\ 2 & A & i & 243 & \odot \end{bmatrix} =$$

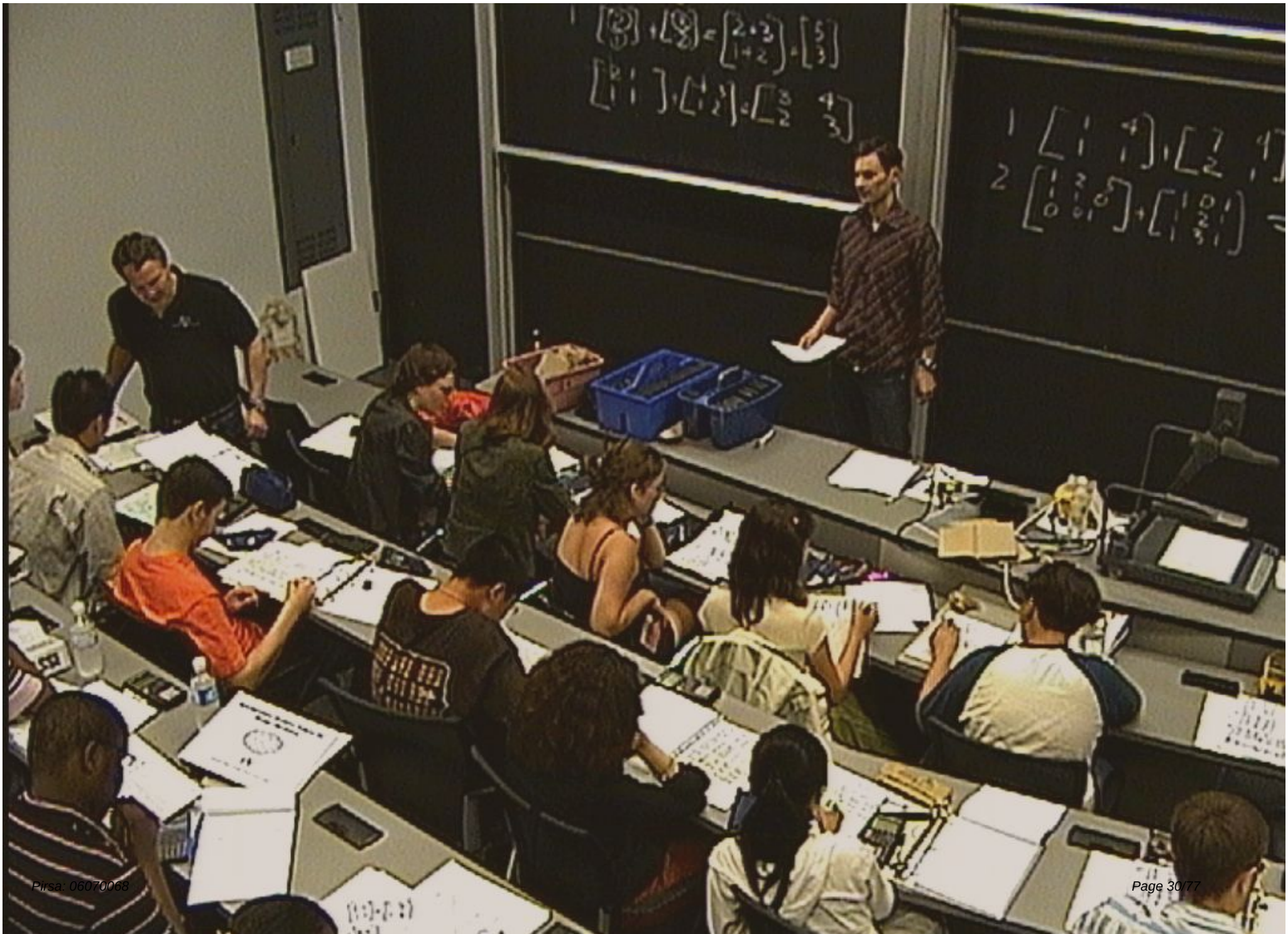

$\begin{bmatrix} 1 & 2 & 4 & i & e^{i\pi} \\ 7 & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9 \cdot 2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} 1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \psi \\ 2 & A & i & 243 & \ddot{\smile} \end{bmatrix} =$
$9,2$

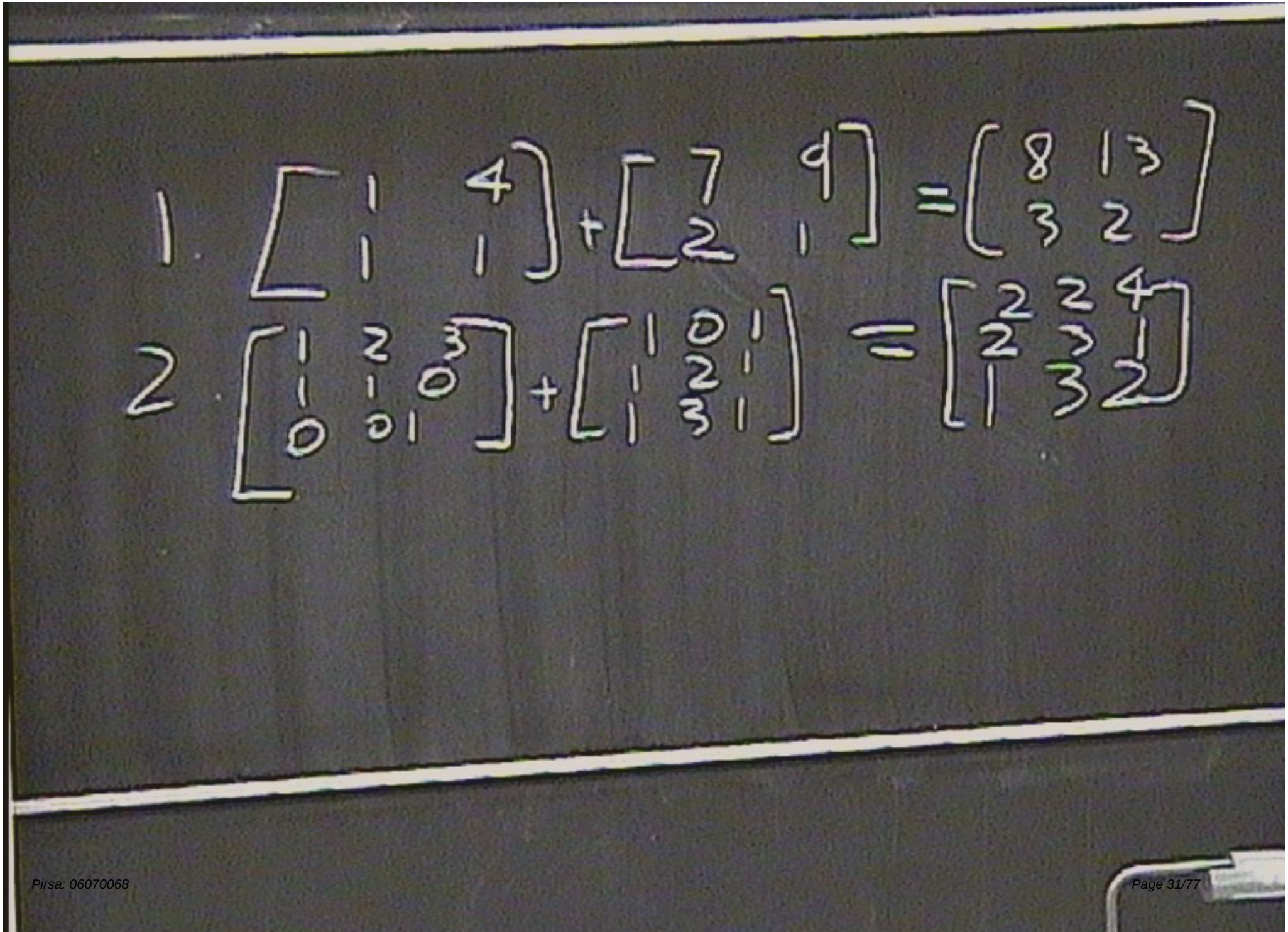

$\begin{bmatrix} 1 & 2 & 4 & i & e^{i\pi} \\ 7 & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9.2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} -1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \psi \\ 2 & A & i & 243 & \ddot{\smile} \end{bmatrix} =$
$9,2$
$9.2 = 9 \times 2$

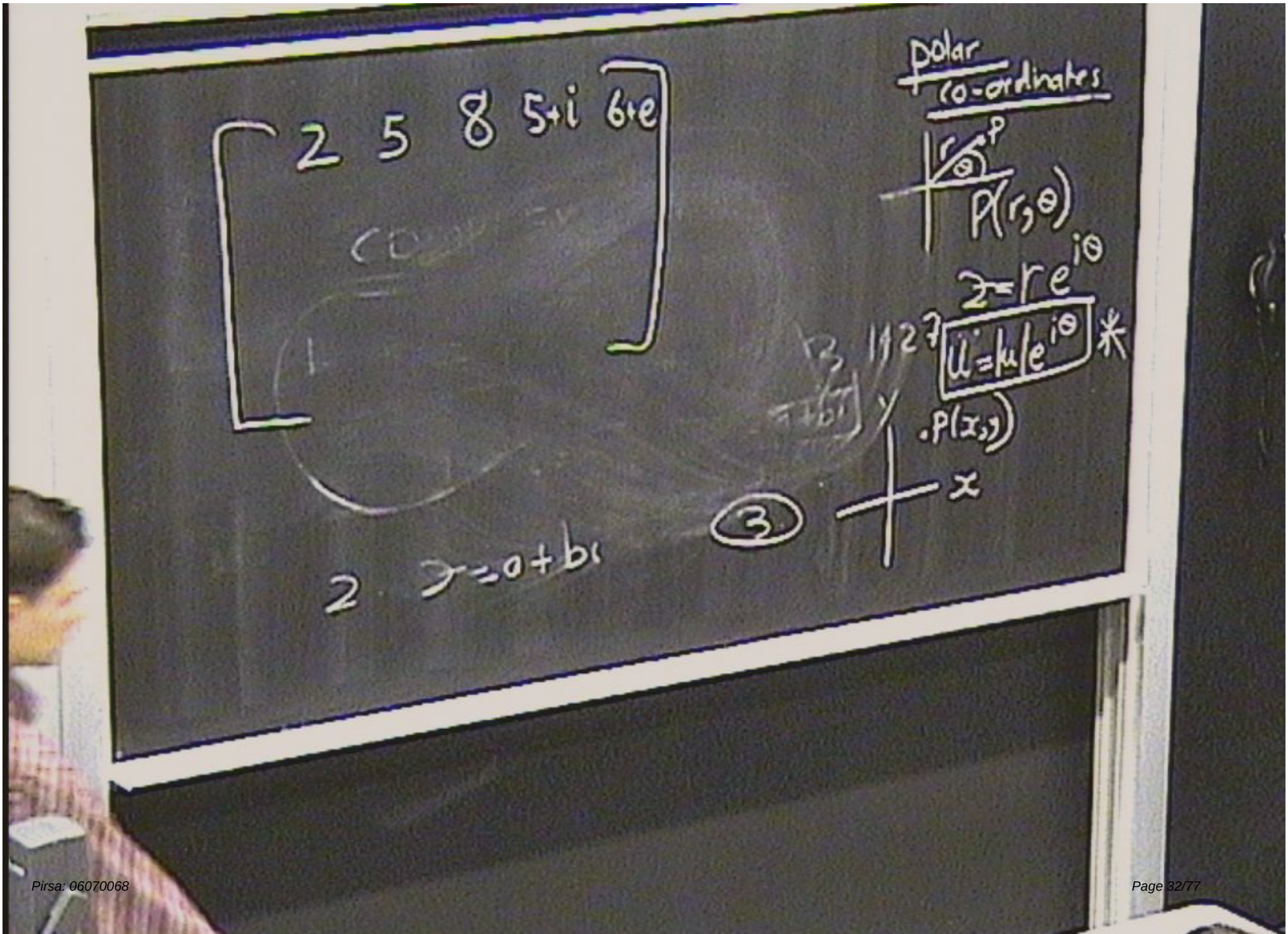

$\begin{bmatrix} 1 & 2 & 4 & i & e^{i\pi} \\ \neq & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9.2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} -1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \psi \\ z & A & i & 243 & \ddot{\smile} \end{bmatrix} =$
$9,2$
$9.2 = 9 \times 2$

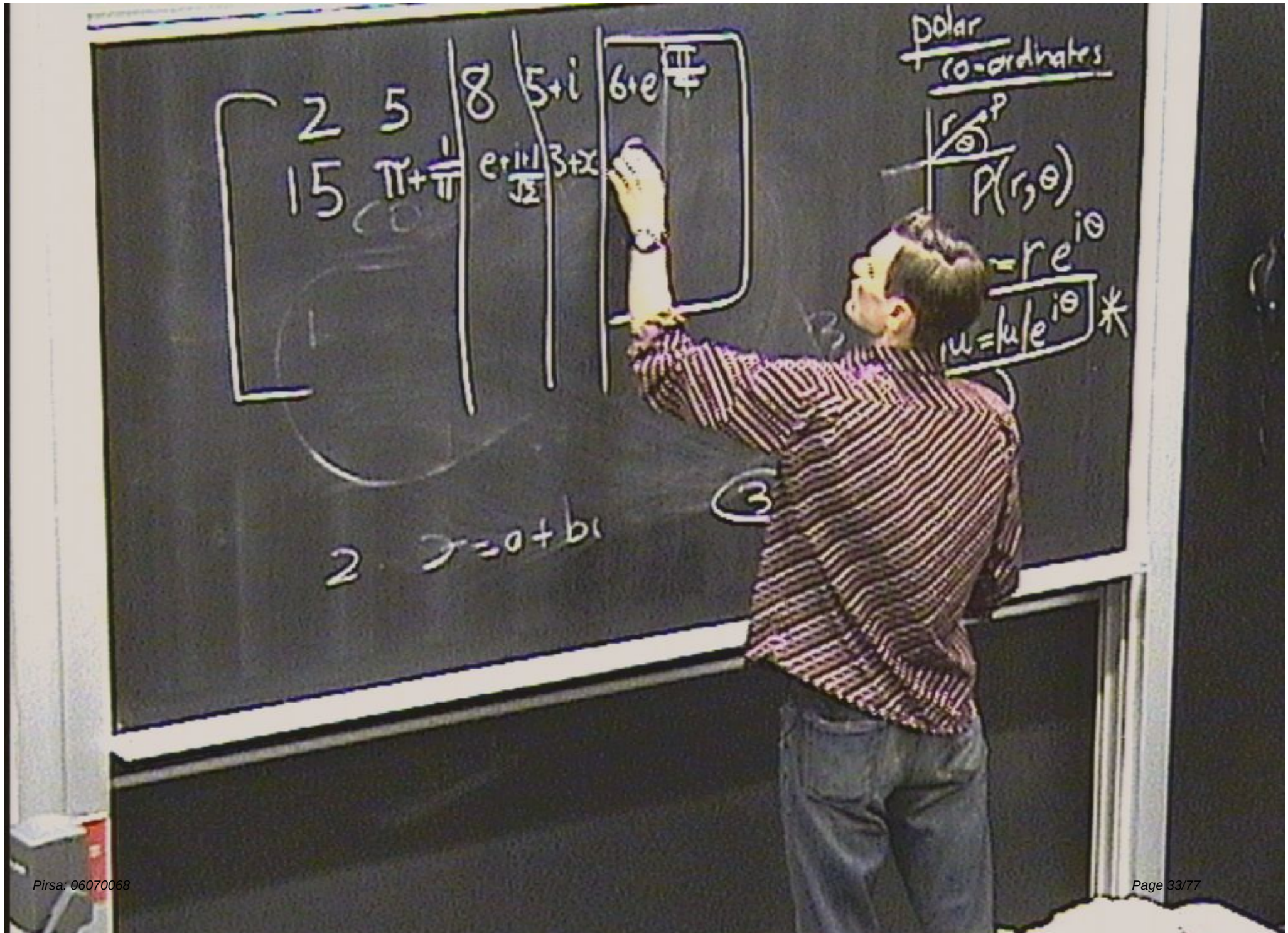

$\begin{bmatrix} 1 & 2 & 4 & i & e^{i\pi} \\ 7 & \pi & e & 3 & 9 \\ e^{i\pi/3} & \log_2 9 & 9.2 & 1 & -17 \end{bmatrix} + \begin{bmatrix} 1 & 3 & 4 & 5 & 6 \\ 8 & \pi^{-1} & \frac{i+1}{\sqrt{2}} & x & \gamma \\ 2 & A & i & 243 & \odot \end{bmatrix} =$
9,2
$9.2 = 9 \times 2$
2.43
2.43
2,43
2 point 43

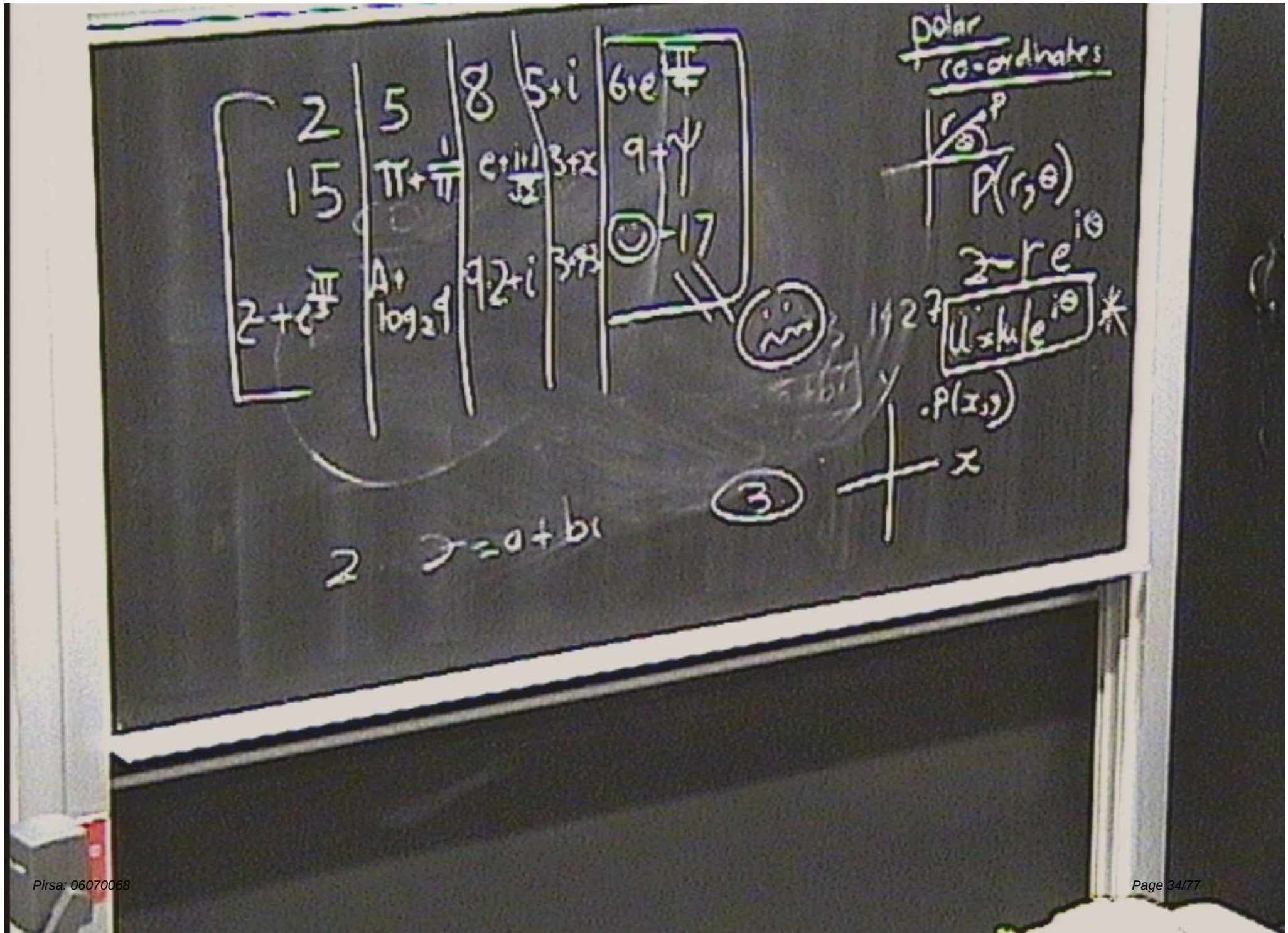

Polar
co-ordinates

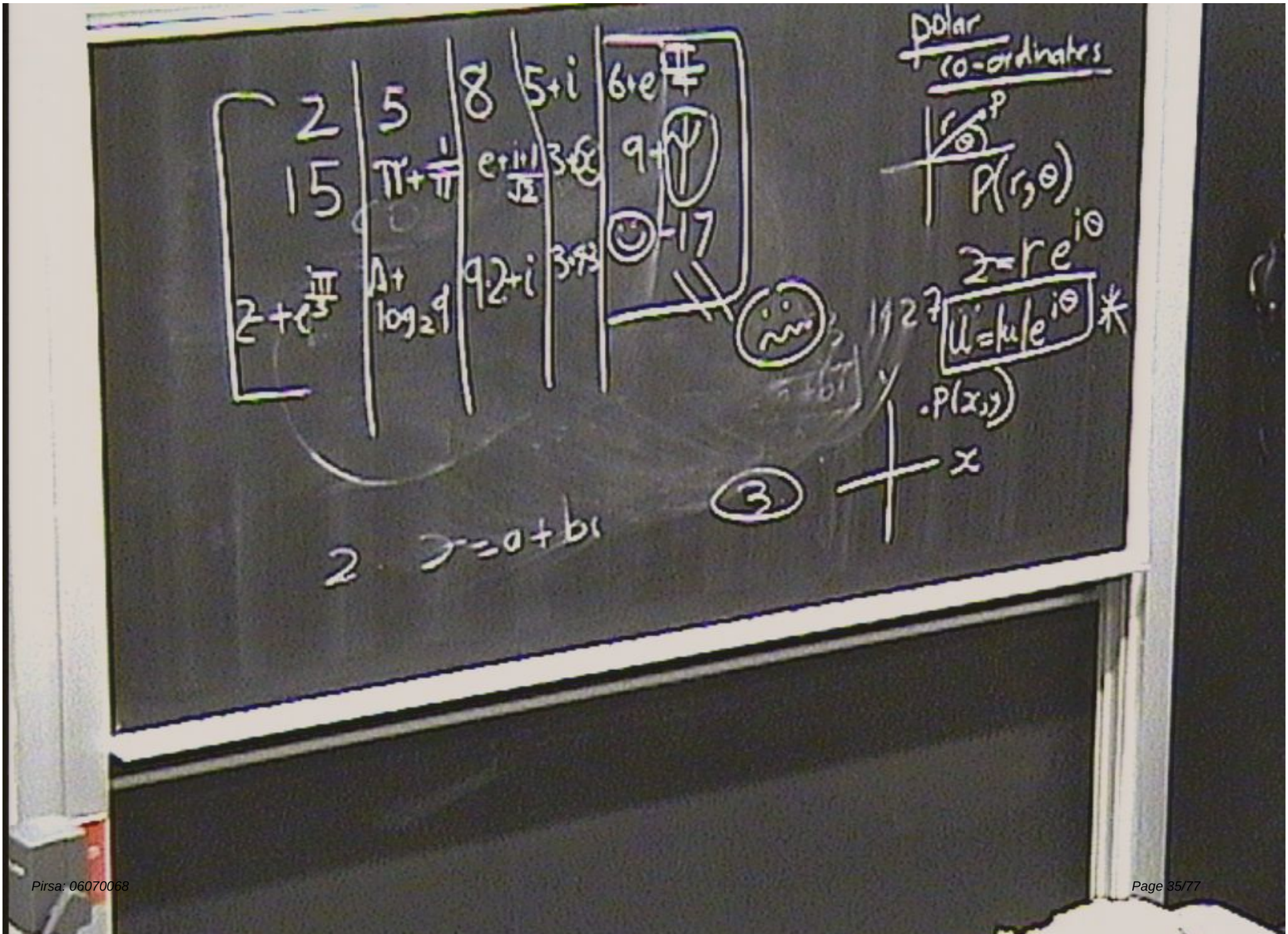


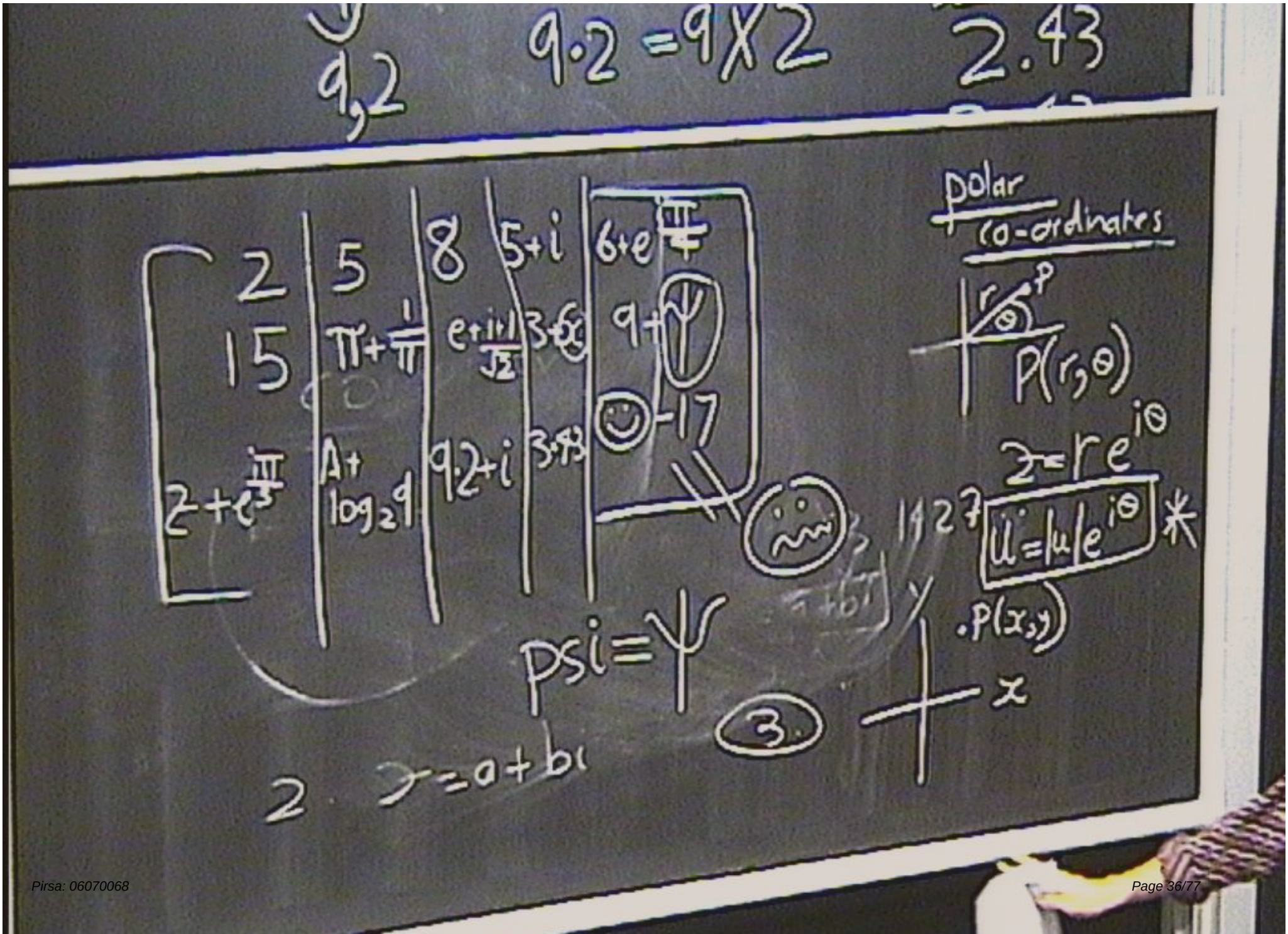

1. [1 4; 1 1] + [7 9; 2 1] = [8 13; 3 2]
2. [1 2 3; 1 1 0; 0 0 1] + [1 0 1; 1 2 1; 1 3 1] = [2 2 4; 2 3 1; 1 3 2]

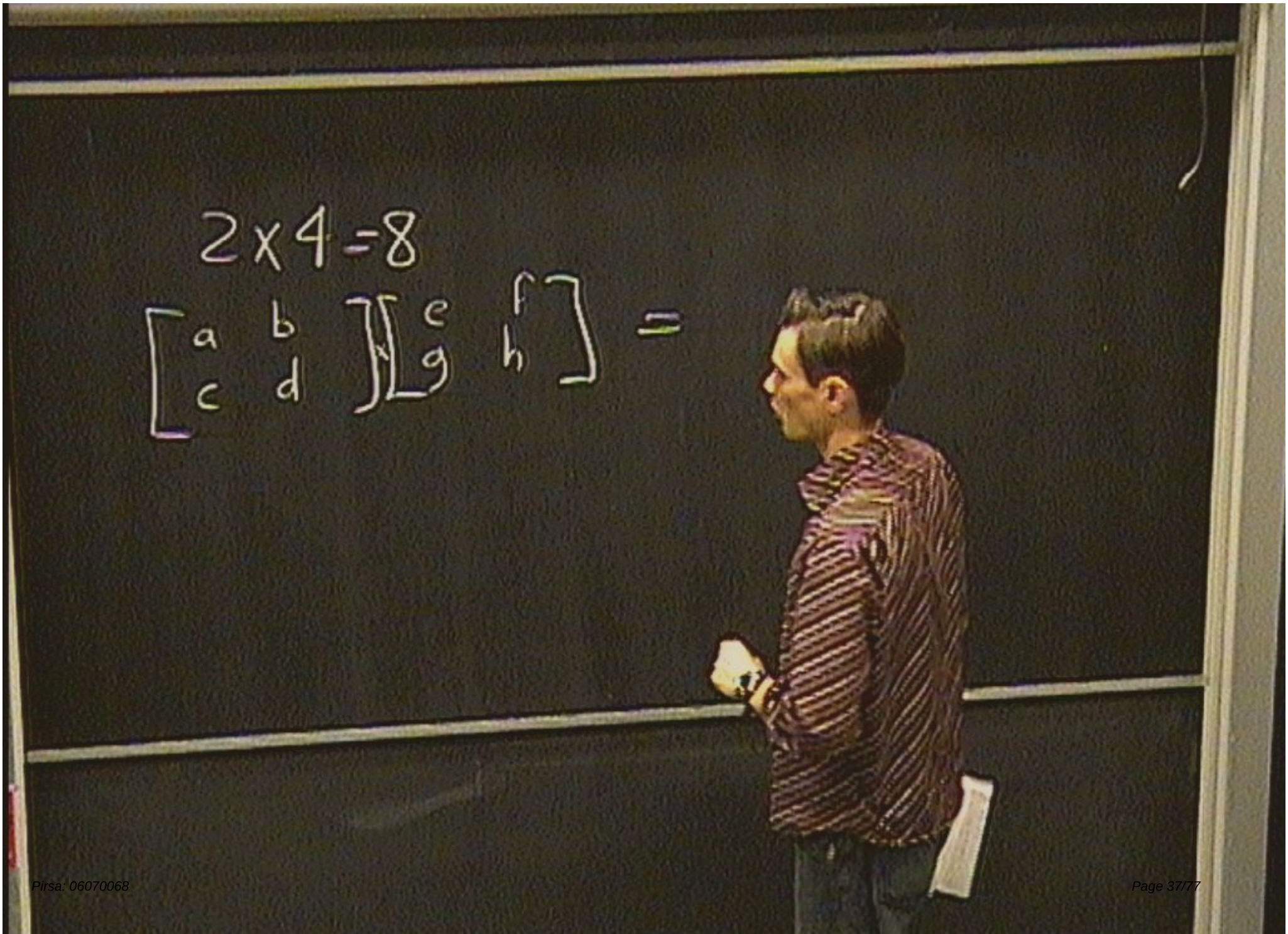

2 5 8 5+i 6+e
Polar co-ordinates
P(r,θ)
z=re^iθ
w=kle^iθ *
.P(x,y)
x
3
2 z=a+bi

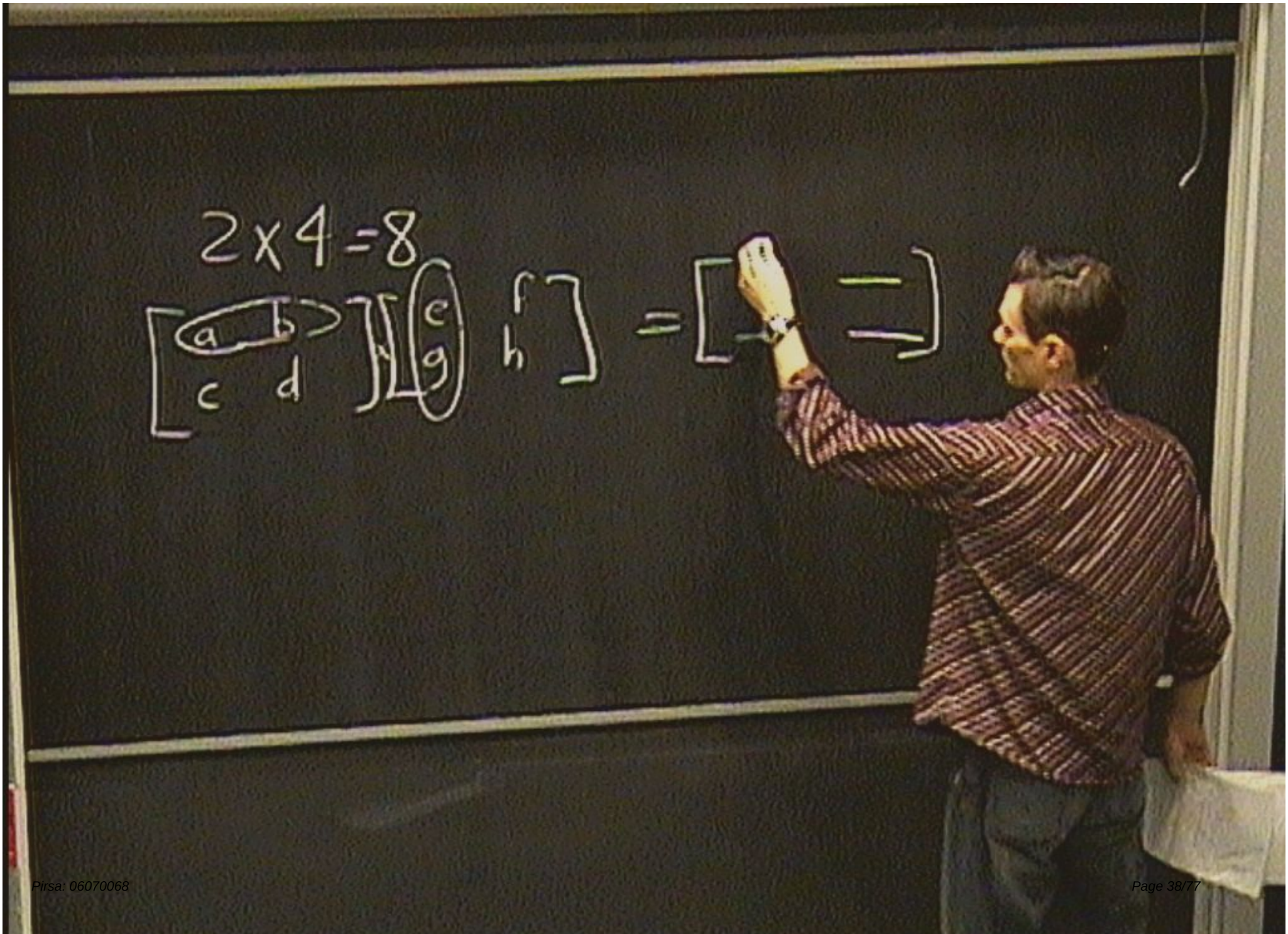

Polar co-ordinates
P(r,θ)
z=re^iθ
w=kle^iθ
2 5
15 π+1/π
8
5+i
6+e^π/4
e+ln1
√2
3+x
2 z=a+bi
3

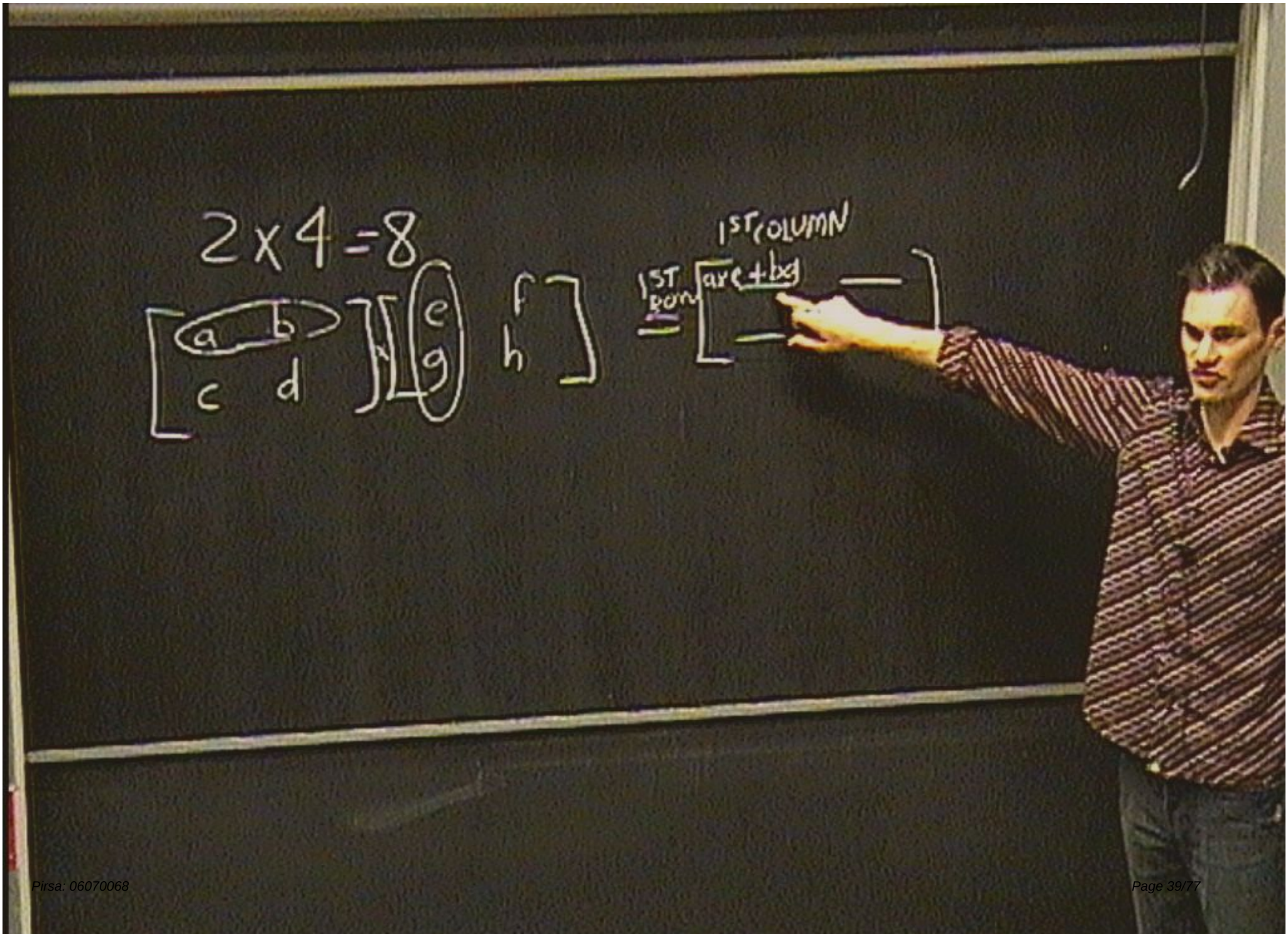

Polar co-ordinates
P(r,θ)
z = re^iθ
P(x,y)
x
y
2 z = a + bi
3

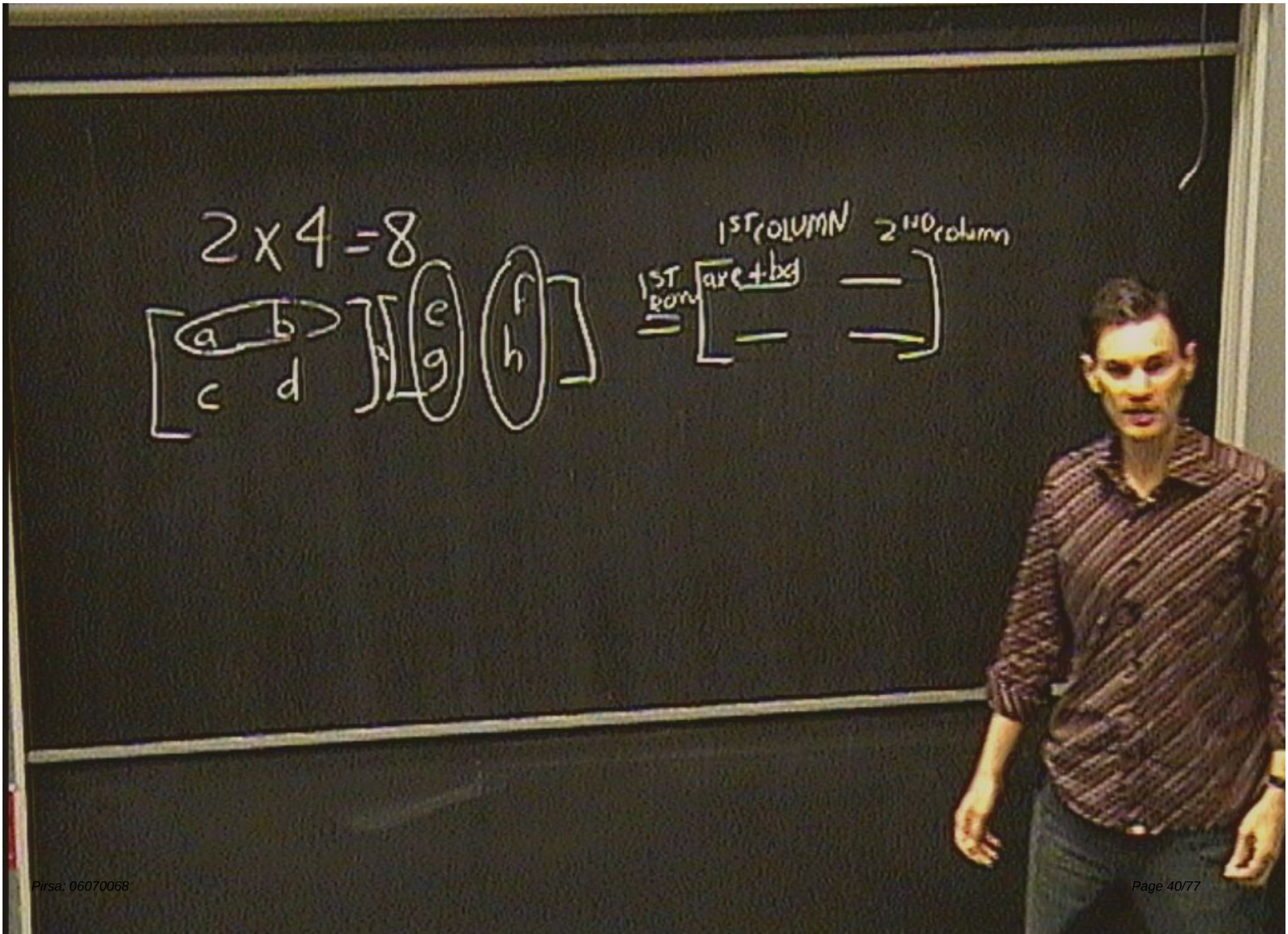

Polar co-ordinates
P(r,θ)
z=re^iθ
w=kle^iθ
P(x,y)
x
y
2 z=a+bi
3.

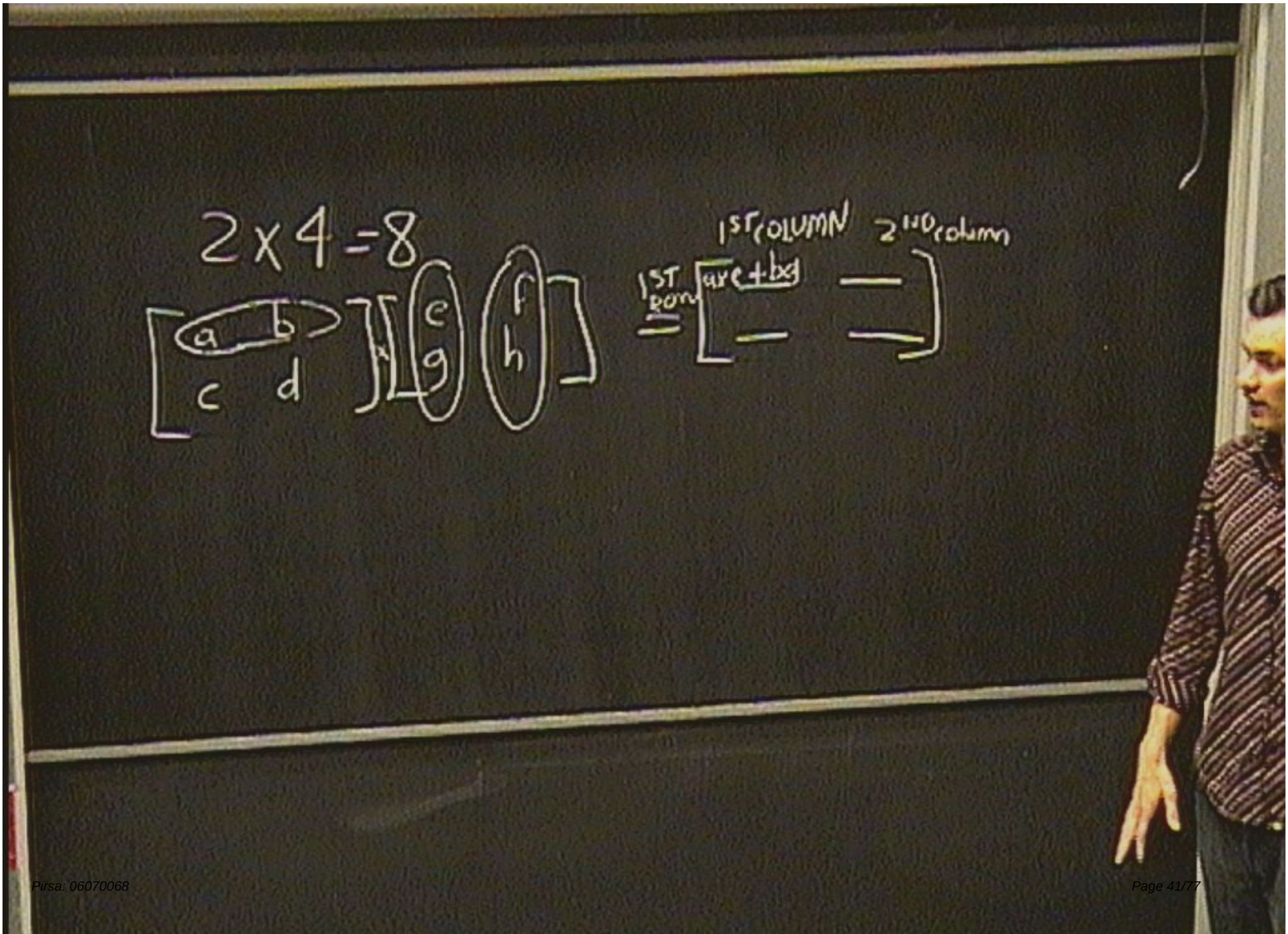

9,2
9.2 = 9X2
2.43
polar co-ordinates
P(r,θ)
z = re^iθ
u = |u|e^iθ
P(x,y)
psi = ψ
z = a + bi
3.

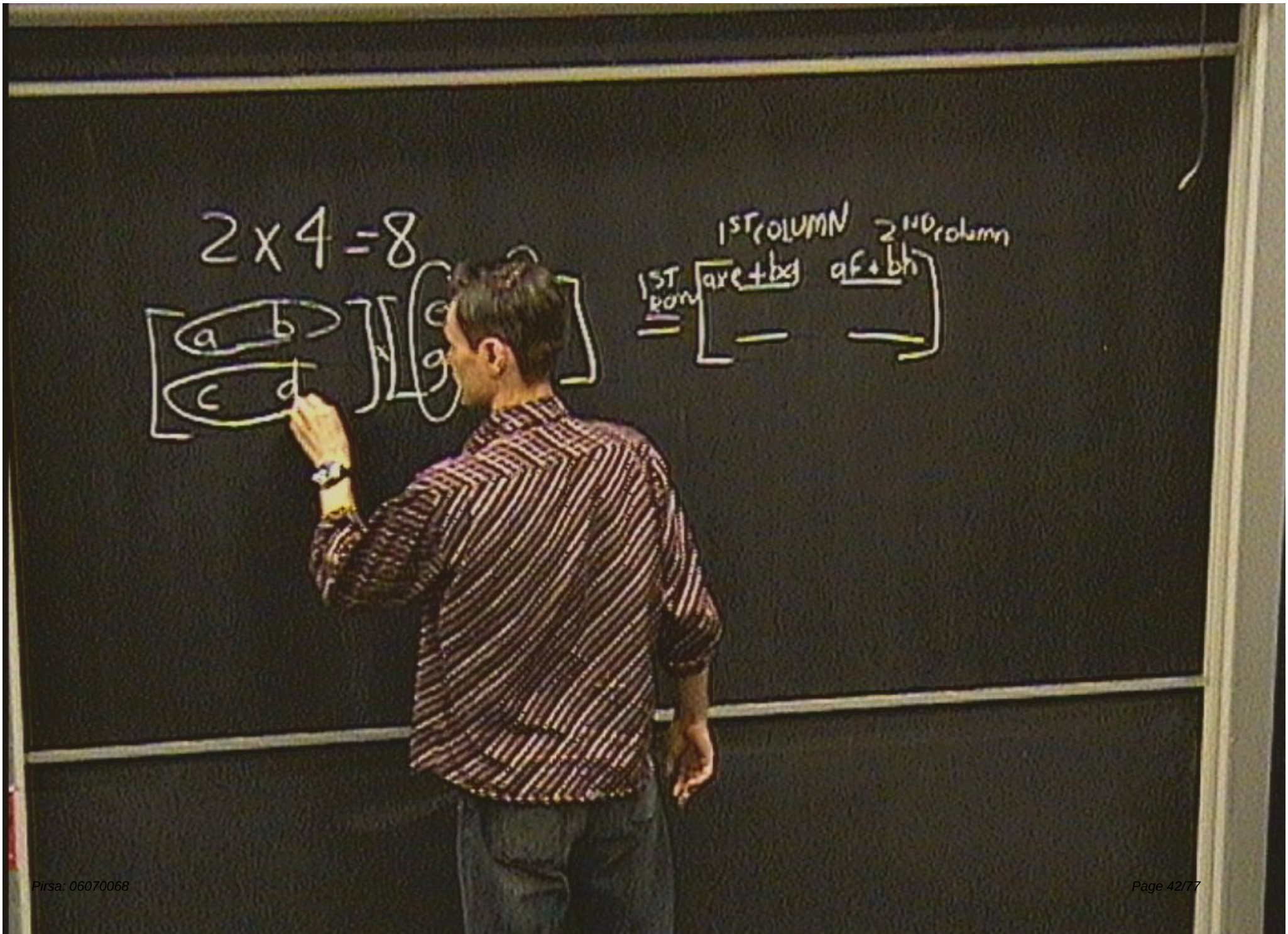

2x4=8
[a b] [e f]
[c d] [g h] =

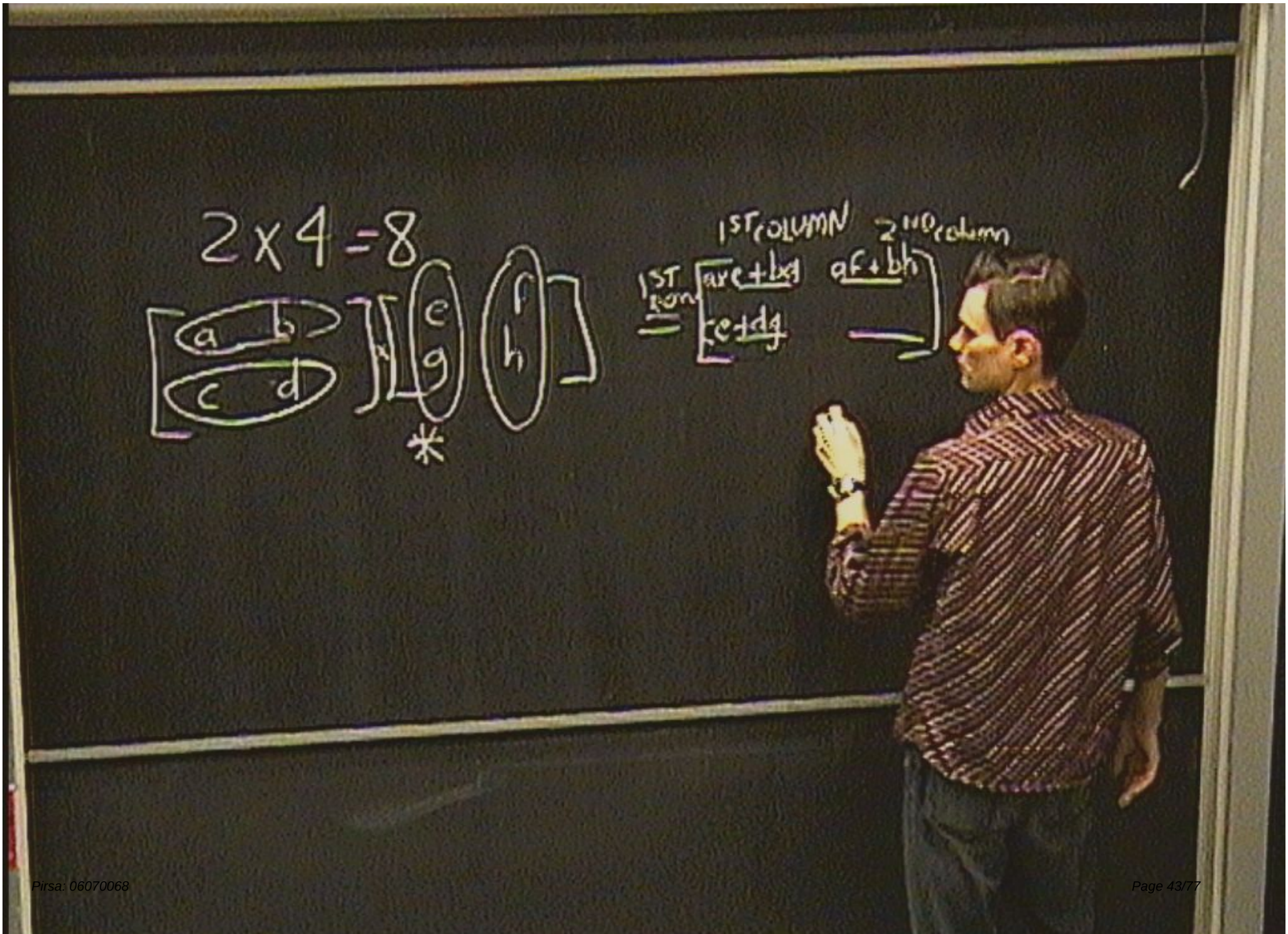

2x4=8
a b
c d
e
g
f
h

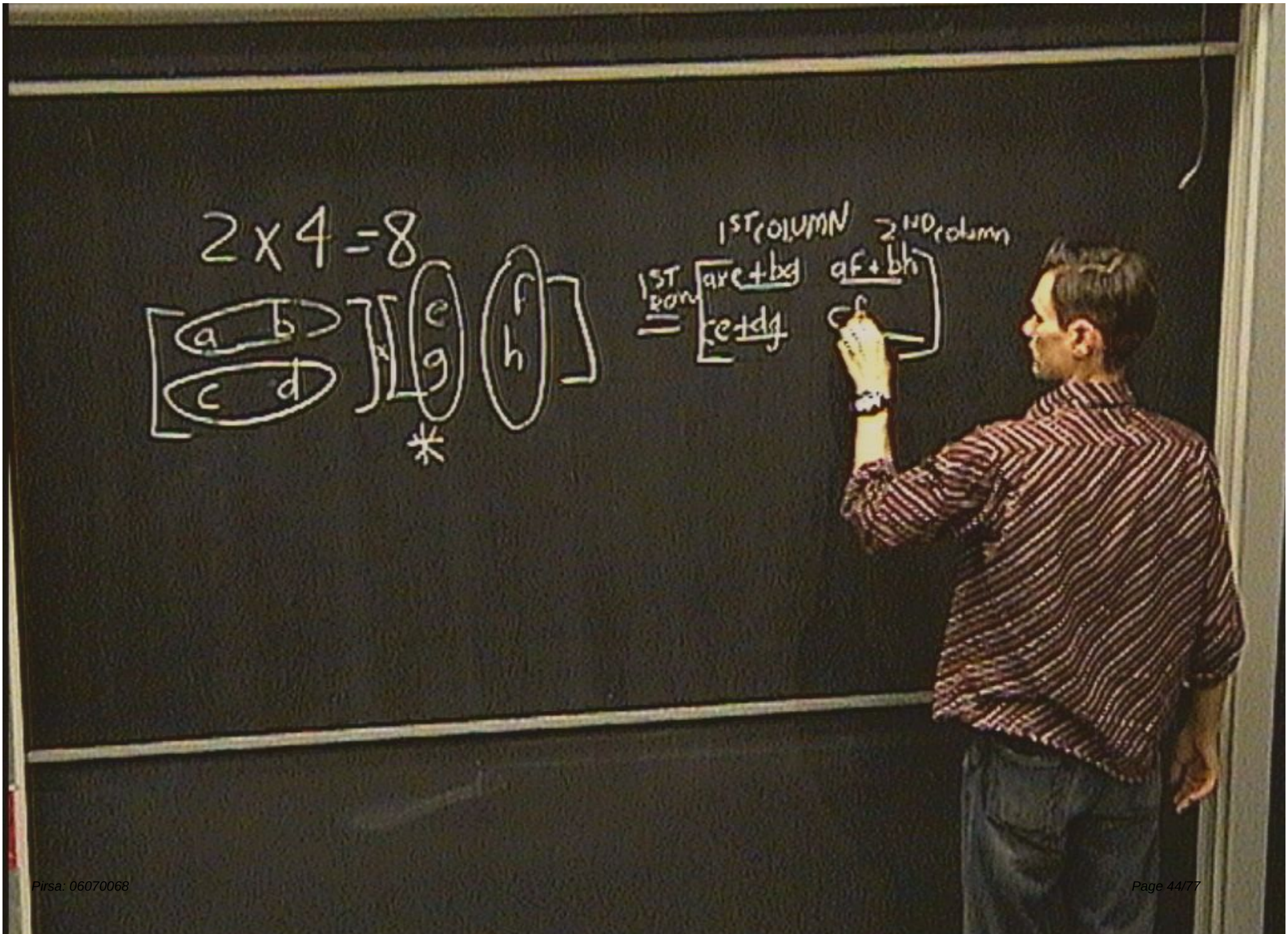

2 x 4 = 8
a b
c d
e
g
f
h
1ST COLUMN
1ST ROW
ae + bg

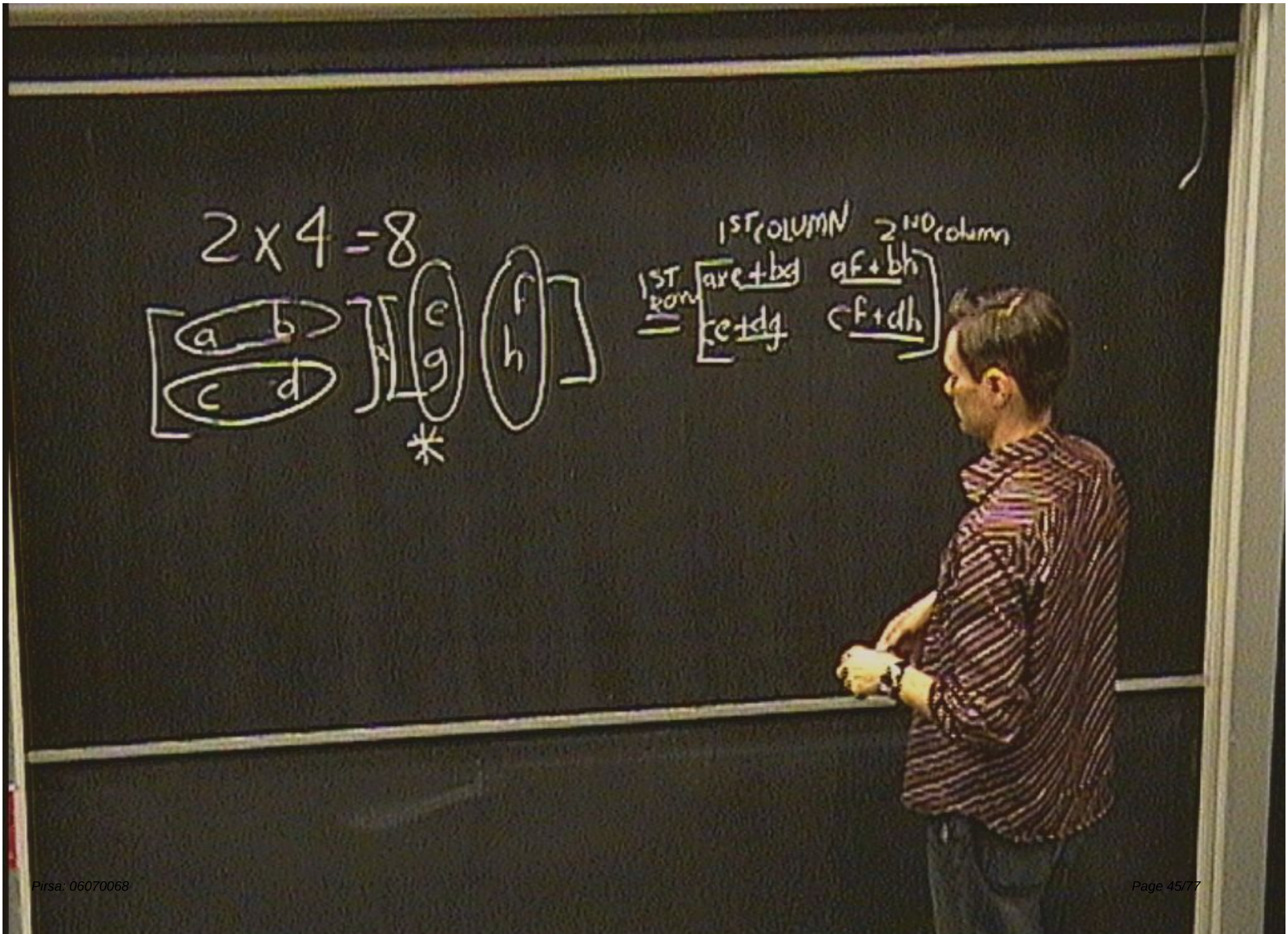

2 x 4 = 8
1ST COLUMN
2ND column
1ST ROW
ae+bg

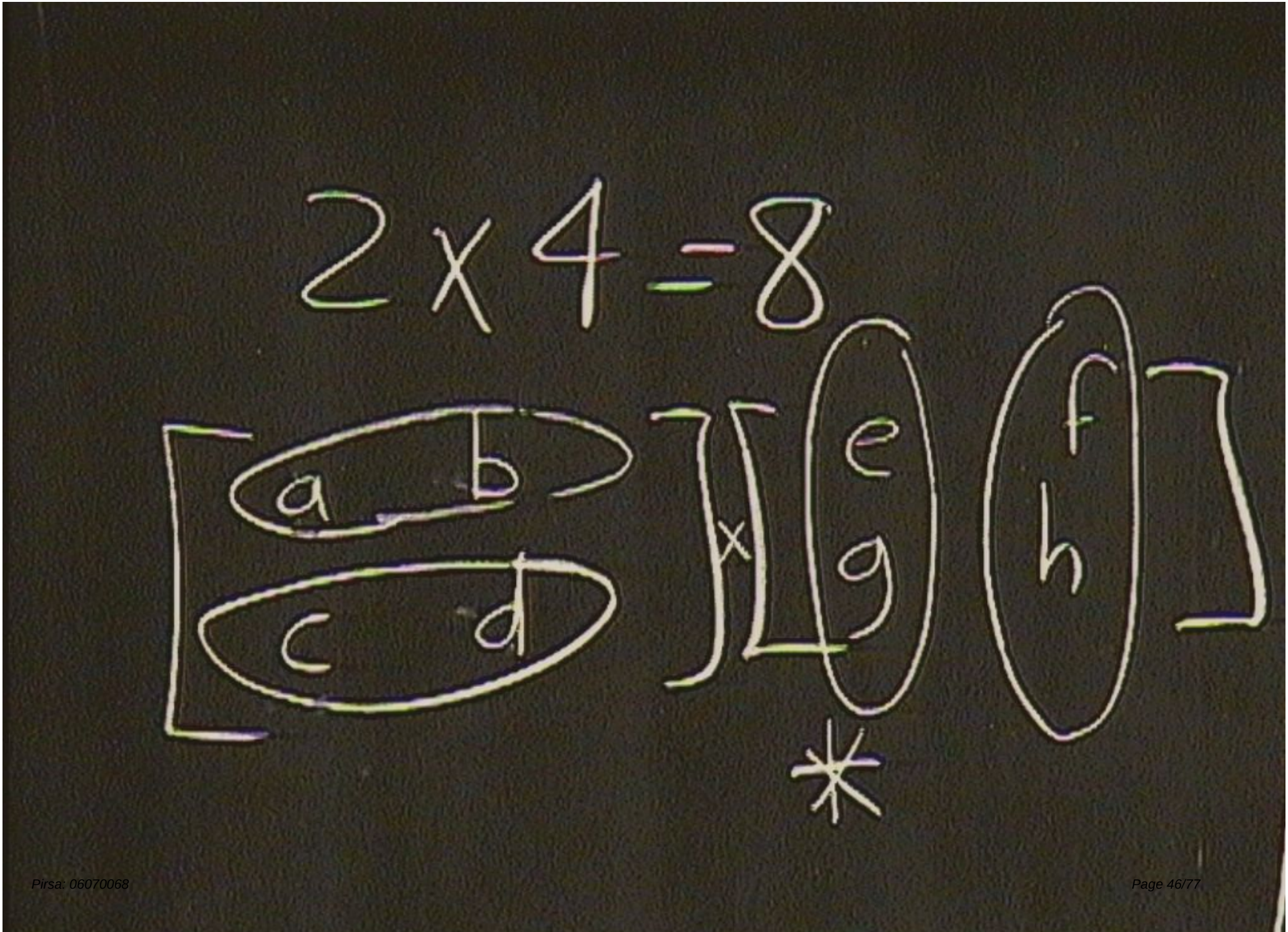

2 x 4 = 8
a b
c d
e f
g h
1ST COLUMN
2ND column
1ST row
ae+bg


2 x 4 = 8
a b
c d
1ST COLUMN
2ND column
1ST ROW
ae+bg
af+bh


2 x 4 = 8
a b
c d
e f
g h
*
1ST COLUMN
2ND column
1ST row
ae+bg
af+bh
ce+dg

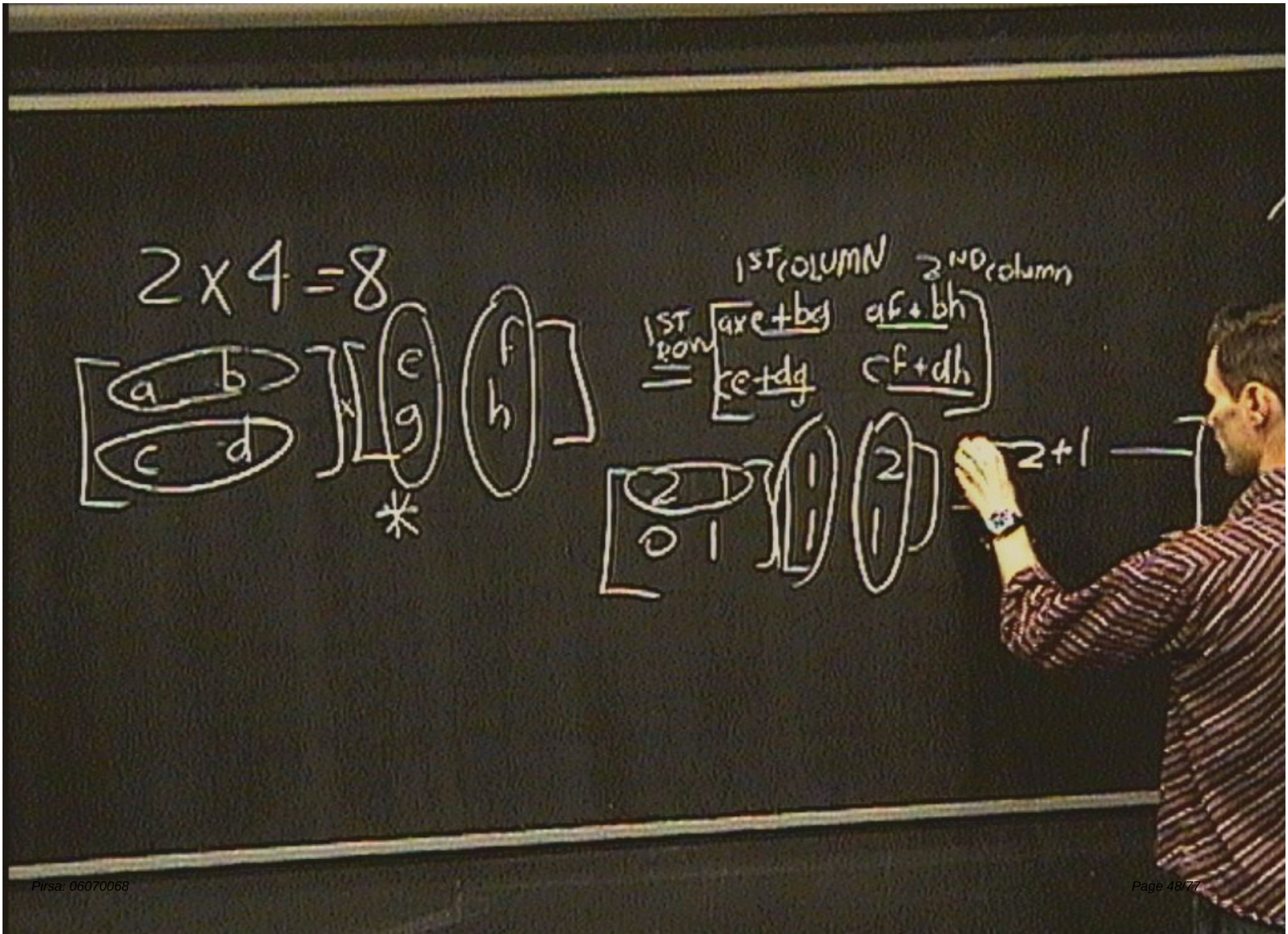

2 x 4 = 8
a b
c d
e g
f h
1ST COLUMN
2ND column
1ST row
ae+bg
af+bh
ce+dg
cf

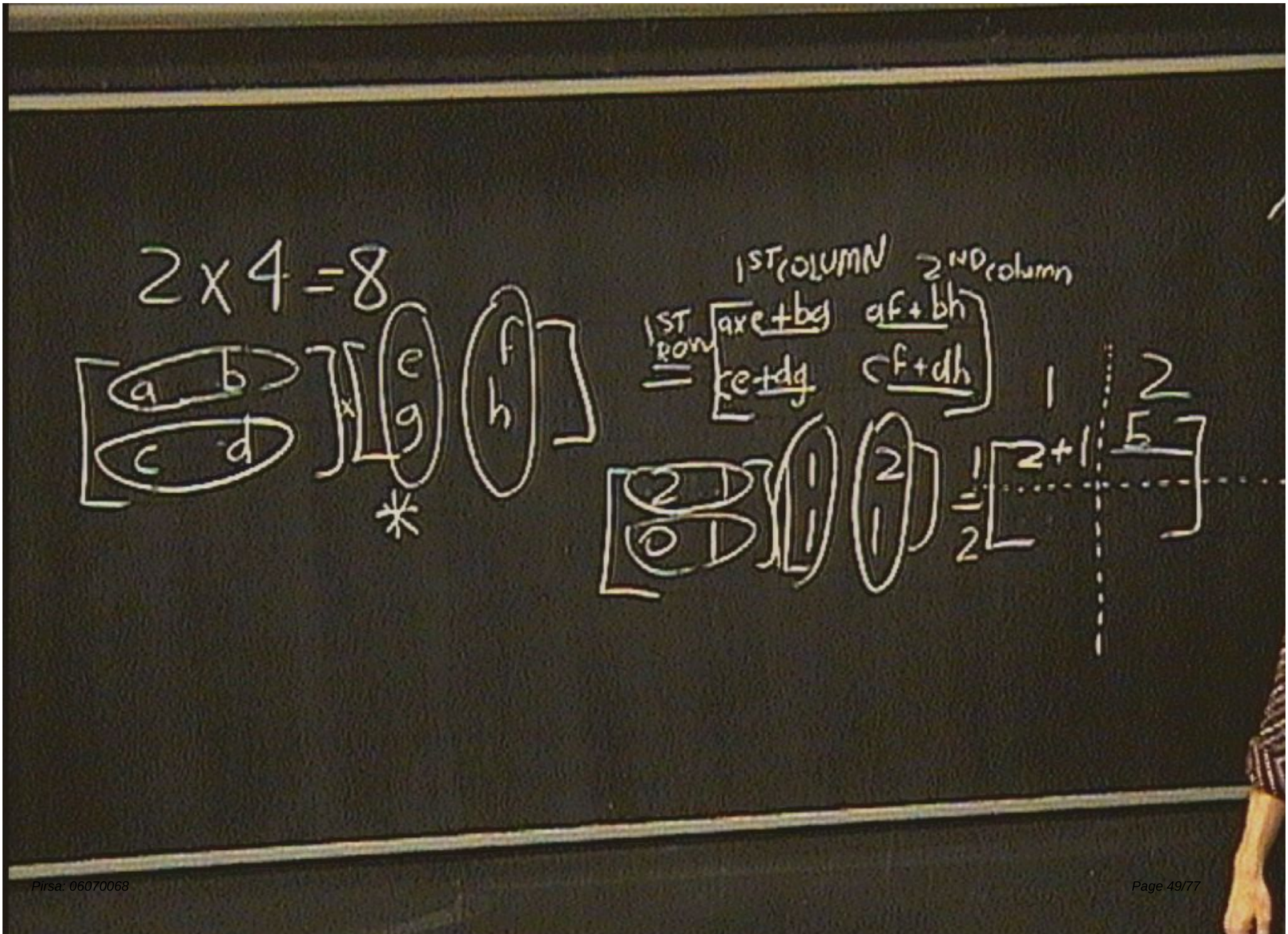

2 x 4 = 8
a b
c d
e g
f h
*
1ST COLUMN
2ND column
1ST row
ae+bg
af+bh
ce+dg
cf+dh

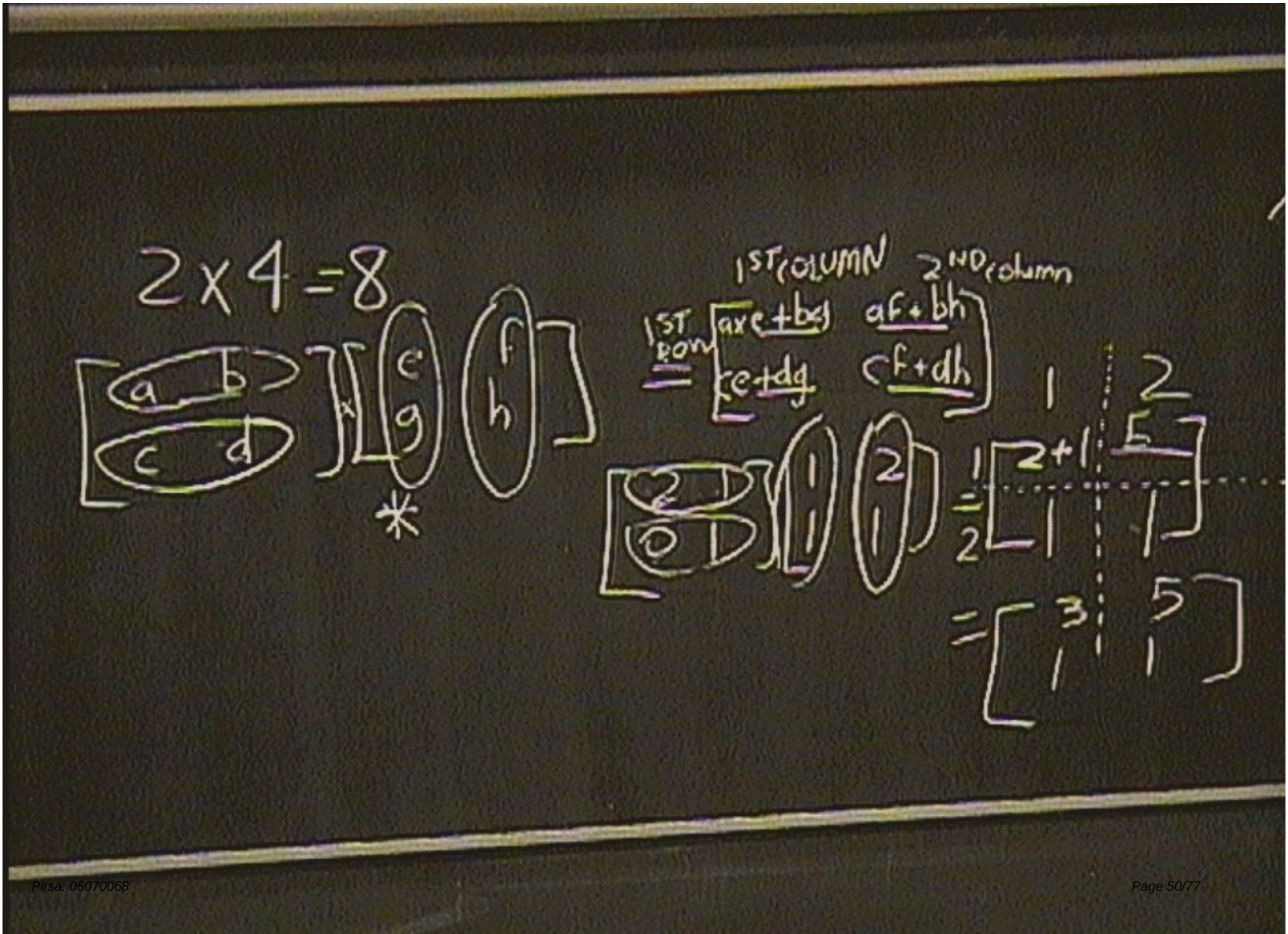

2 x 4 = 8
a b
c d
x
e f
g h
*

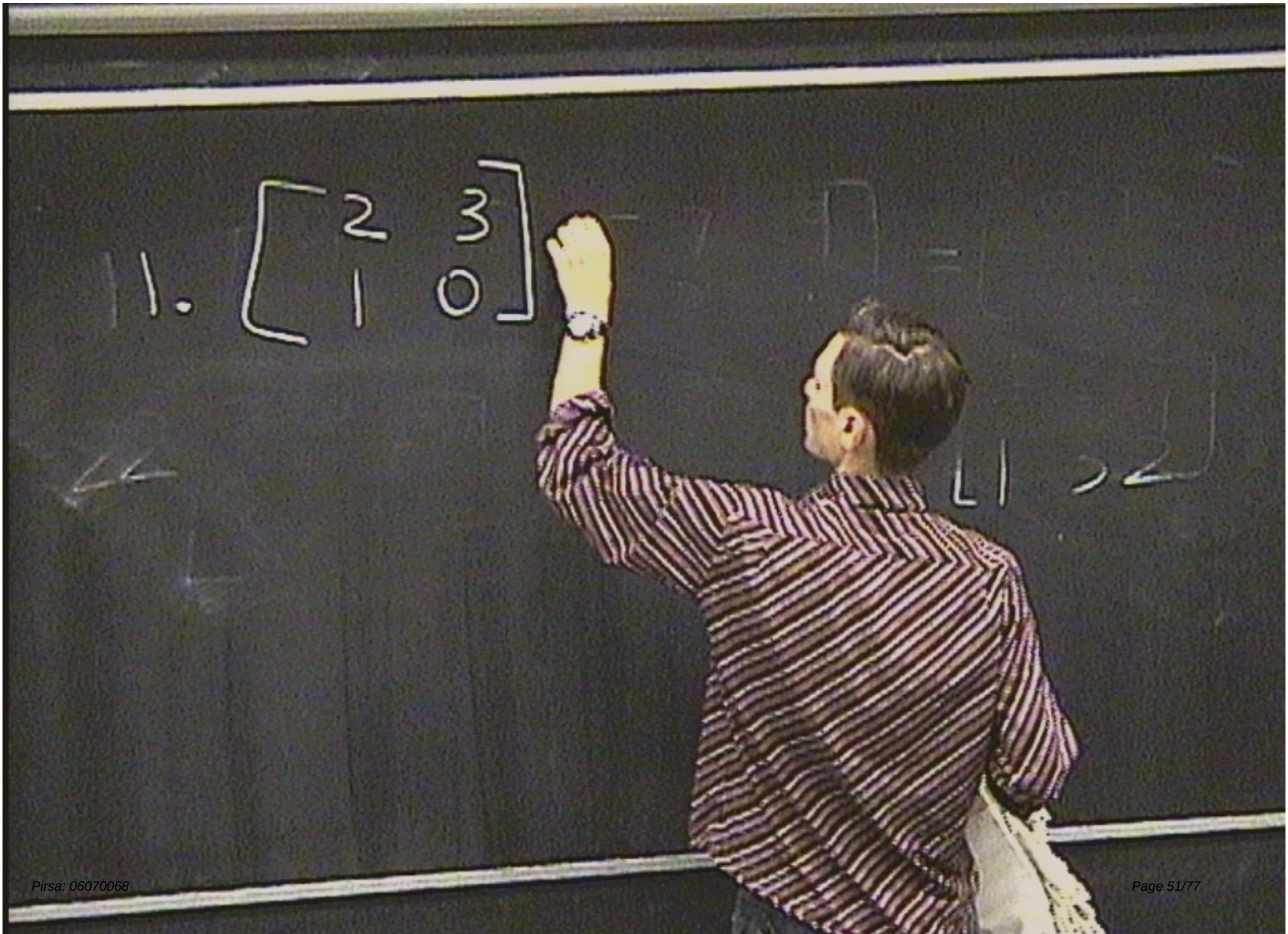
1ST COLUMN 2ND colun

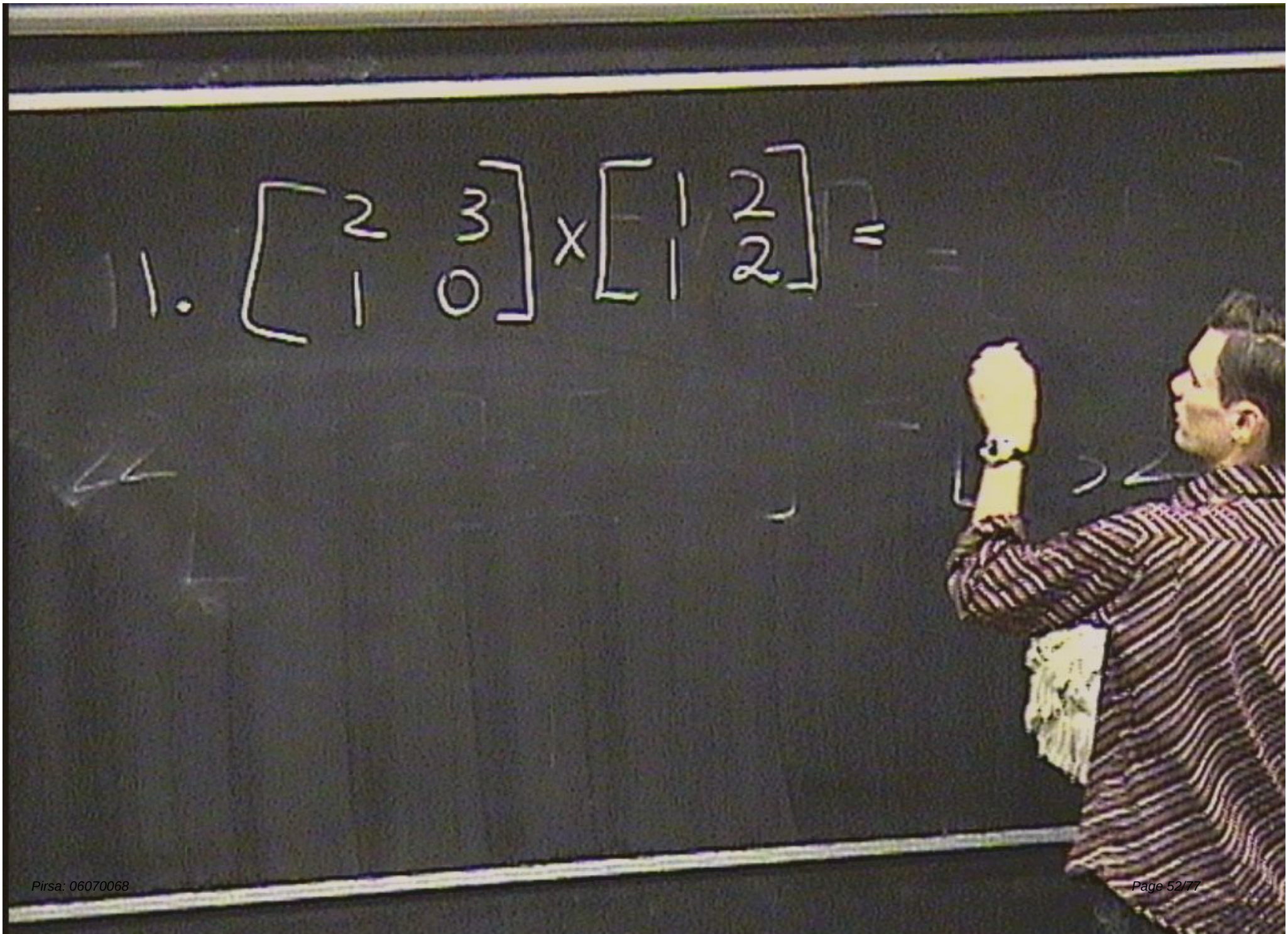
1ST ROW $\begin{bmatrix} ae+bg & af+bh \\ ce+dg & cf+dh \end{bmatrix}$

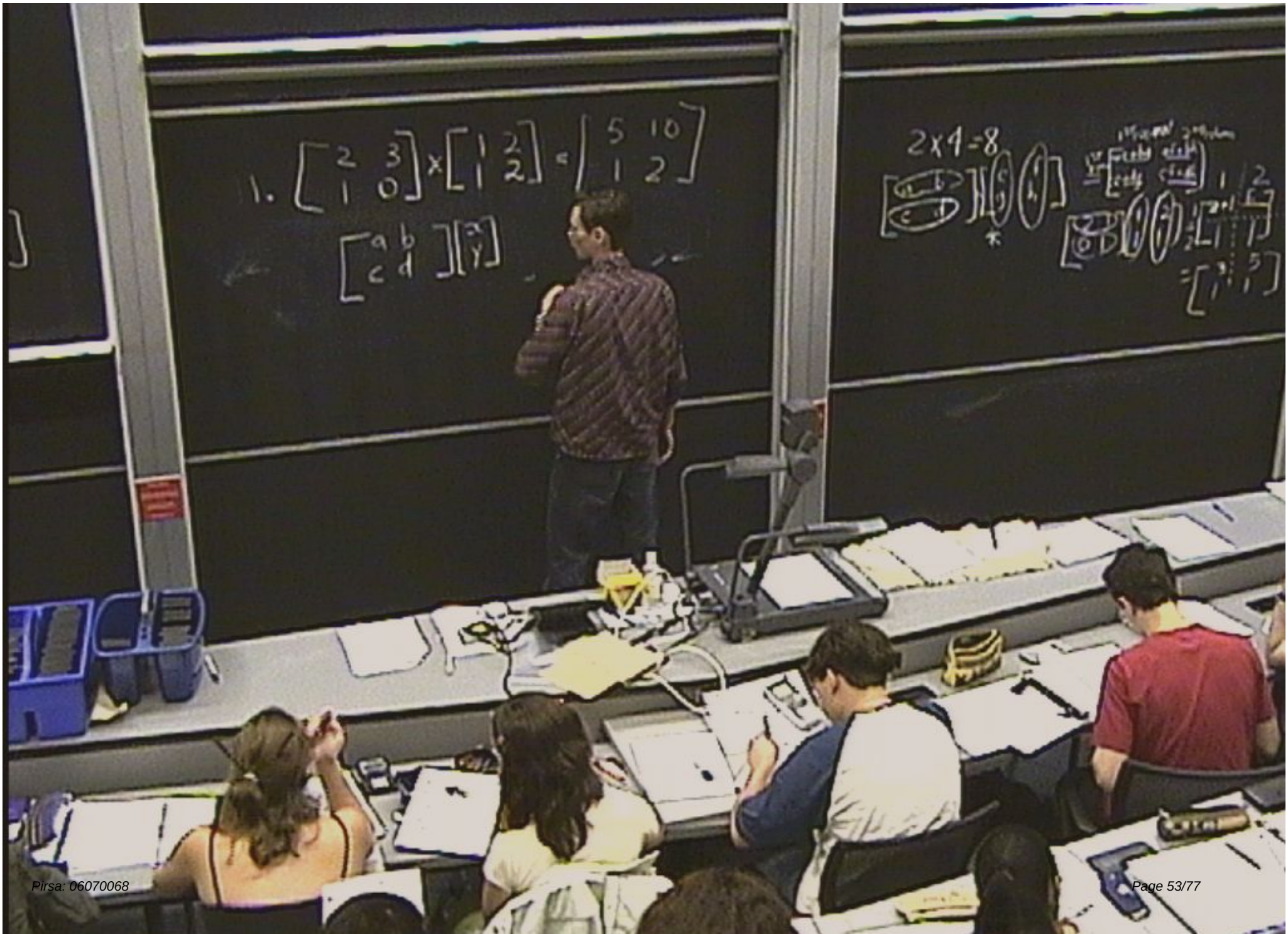

2 x 4 = 8
a b
c d
e g
f h
1ST COLUMN
2ND column
1ST row
axe+bcg
aF+bh
ce+dg
cf+dh
2+1

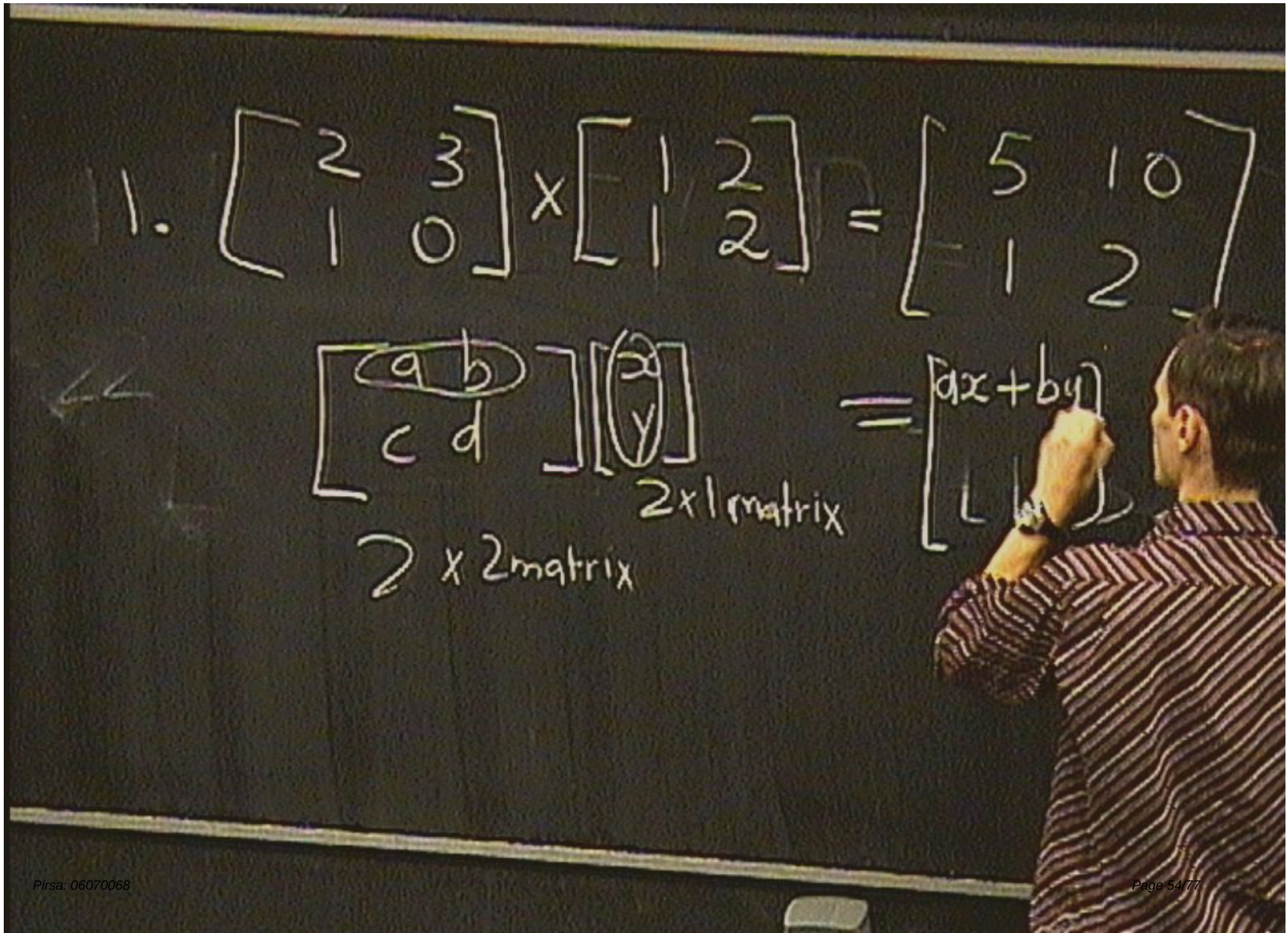

2 x 4 = 8
1ST COLUMN
2ND column
1ST row
ae+bg
af+bh
ce+dg
cf+dh
1
2
2+1
5

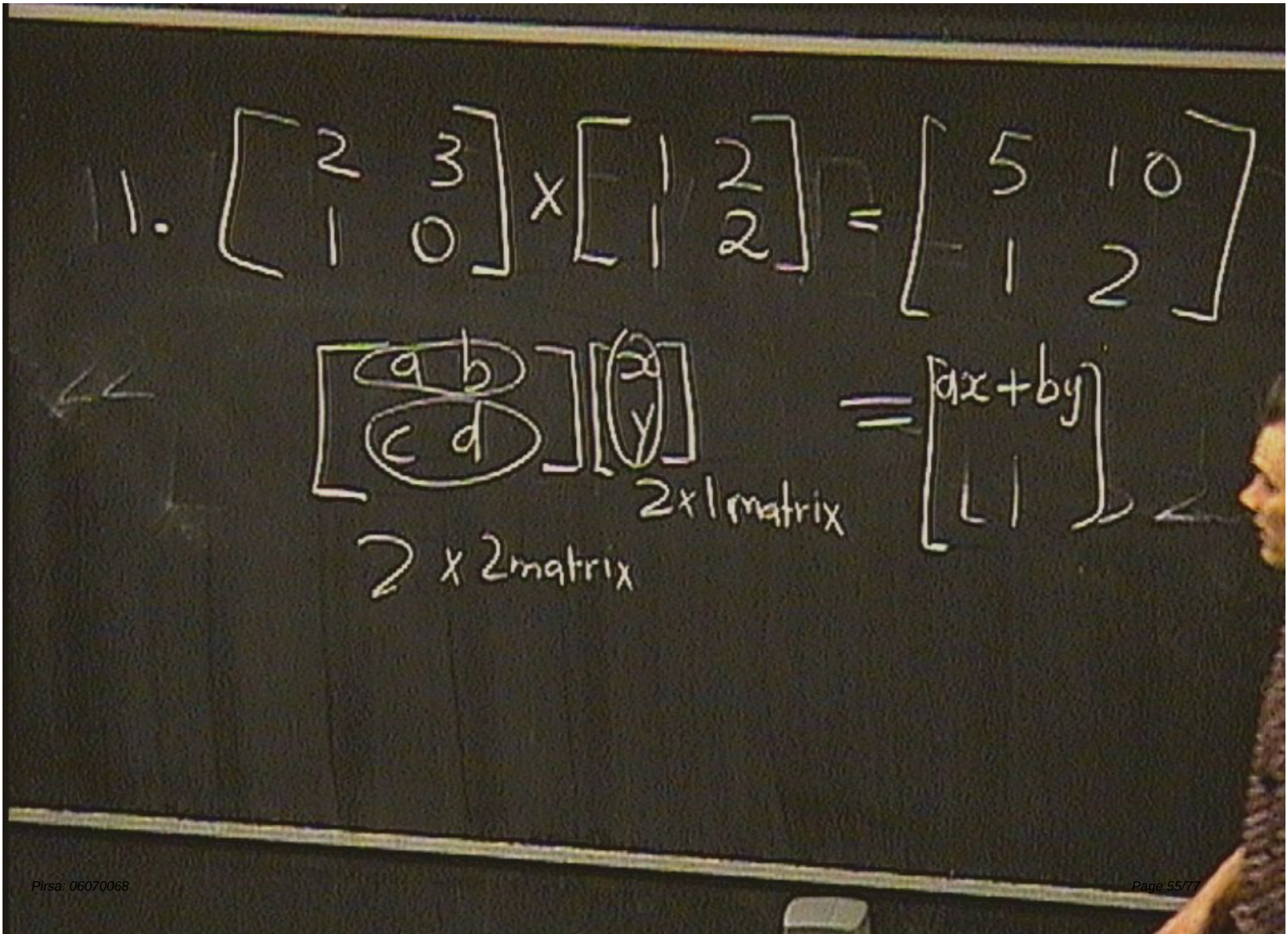

2 x 4 = 8
1ST COLUMN
2ND column
1ST ROW
ae+bg
af+bh
ce+dg
cf+dh
1
2
2+1
5
3


1. [2 3 / 1 0]


1. $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} =$


2x1=8


1. $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 10 \\ 1 & 2 \end{bmatrix}$
$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} ax+by \\ \end{bmatrix}$
2x1 matrix
2 x 2 matrix


1. $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 10 \\ 1 & 2 \end{bmatrix}$
$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} ax+by \\ \square \end{bmatrix}$
2 x 2 matrix
2x1 matrix

1. $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 10 \\ 1 & 2 \end{bmatrix}$

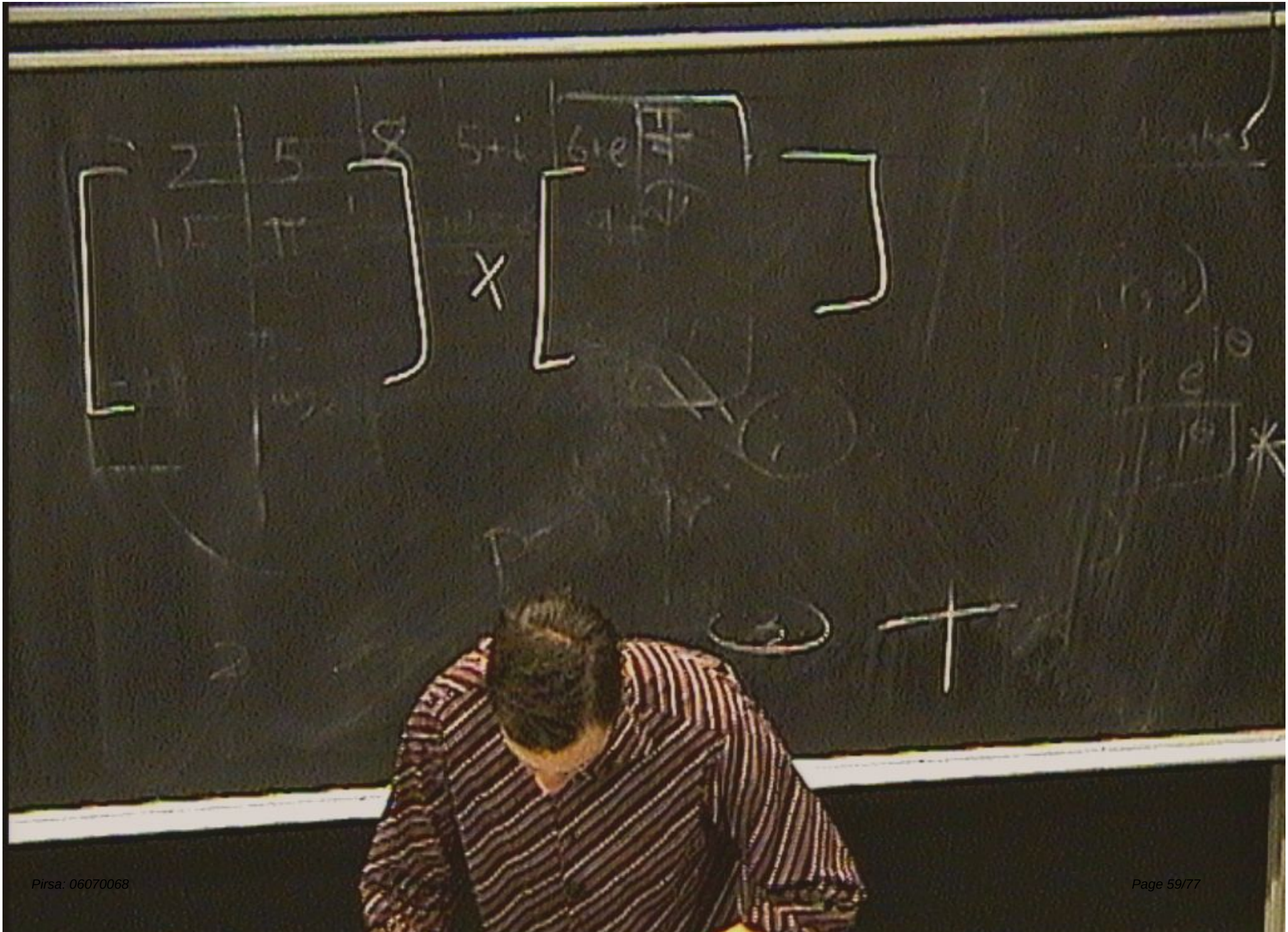
$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} ax+by \\ cx+dy \end{bmatrix}$

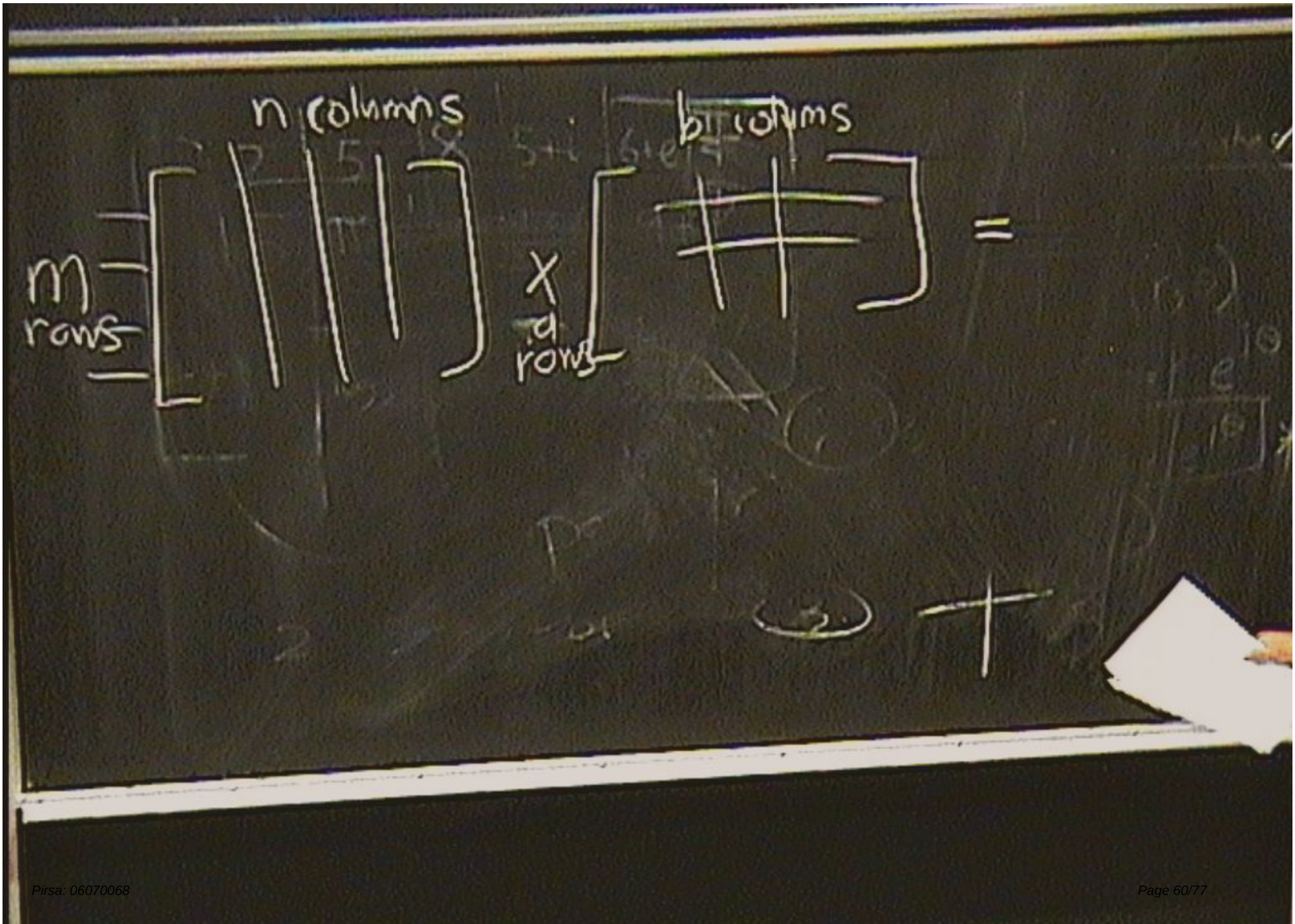
2×2 matrix

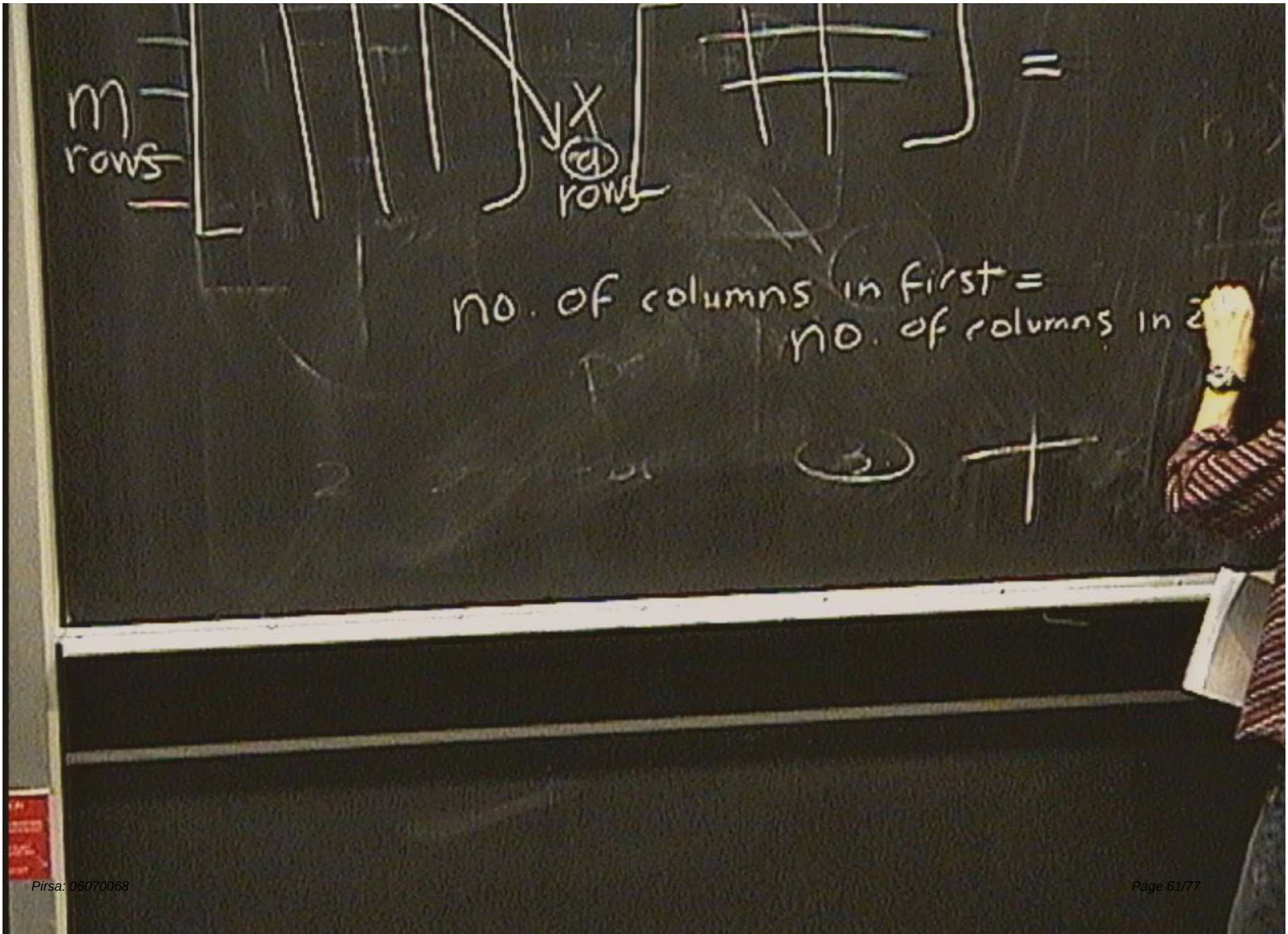
2×1 matrix

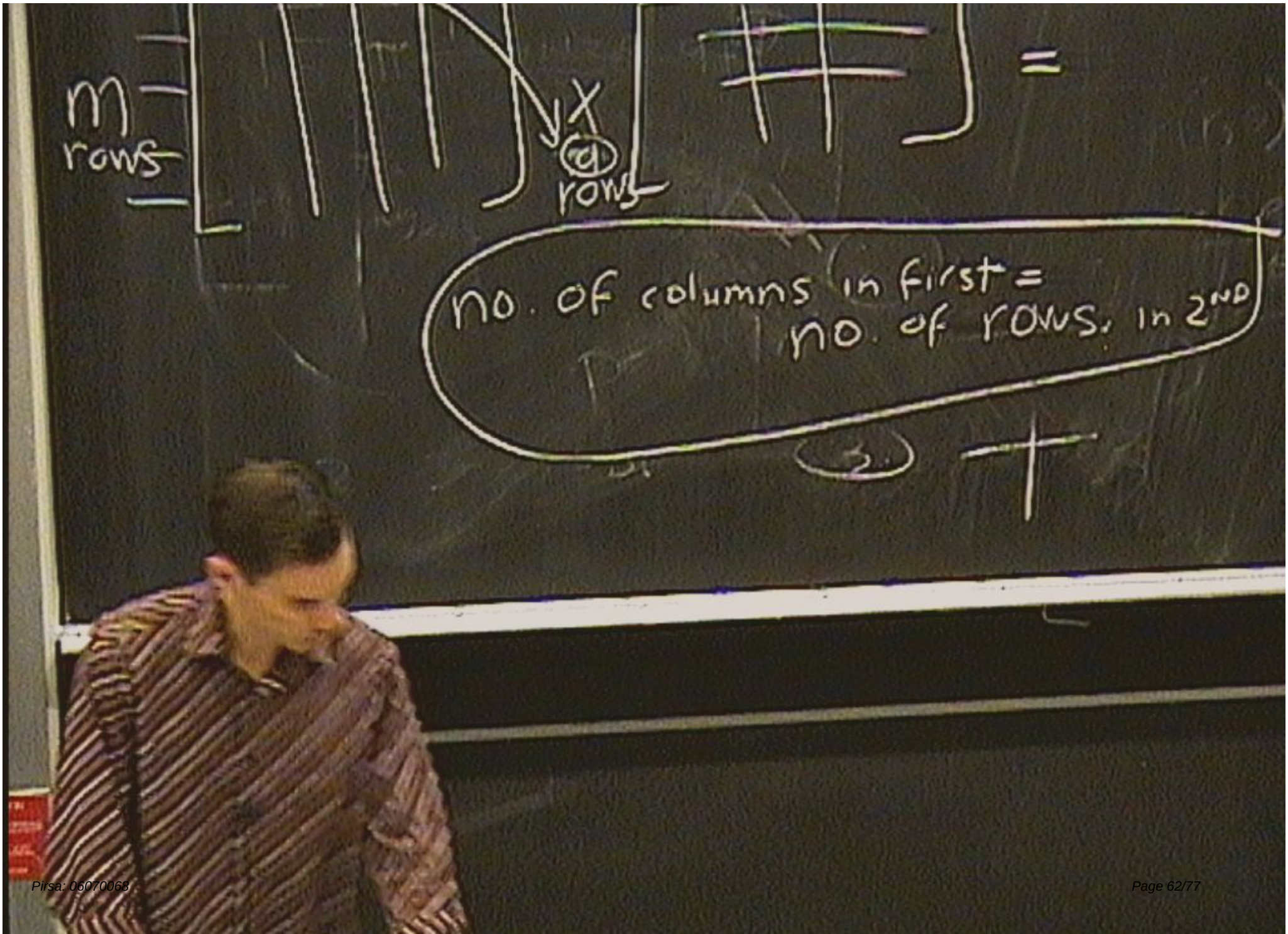
$$\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \end{bmatrix} = \begin{bmatrix}$$

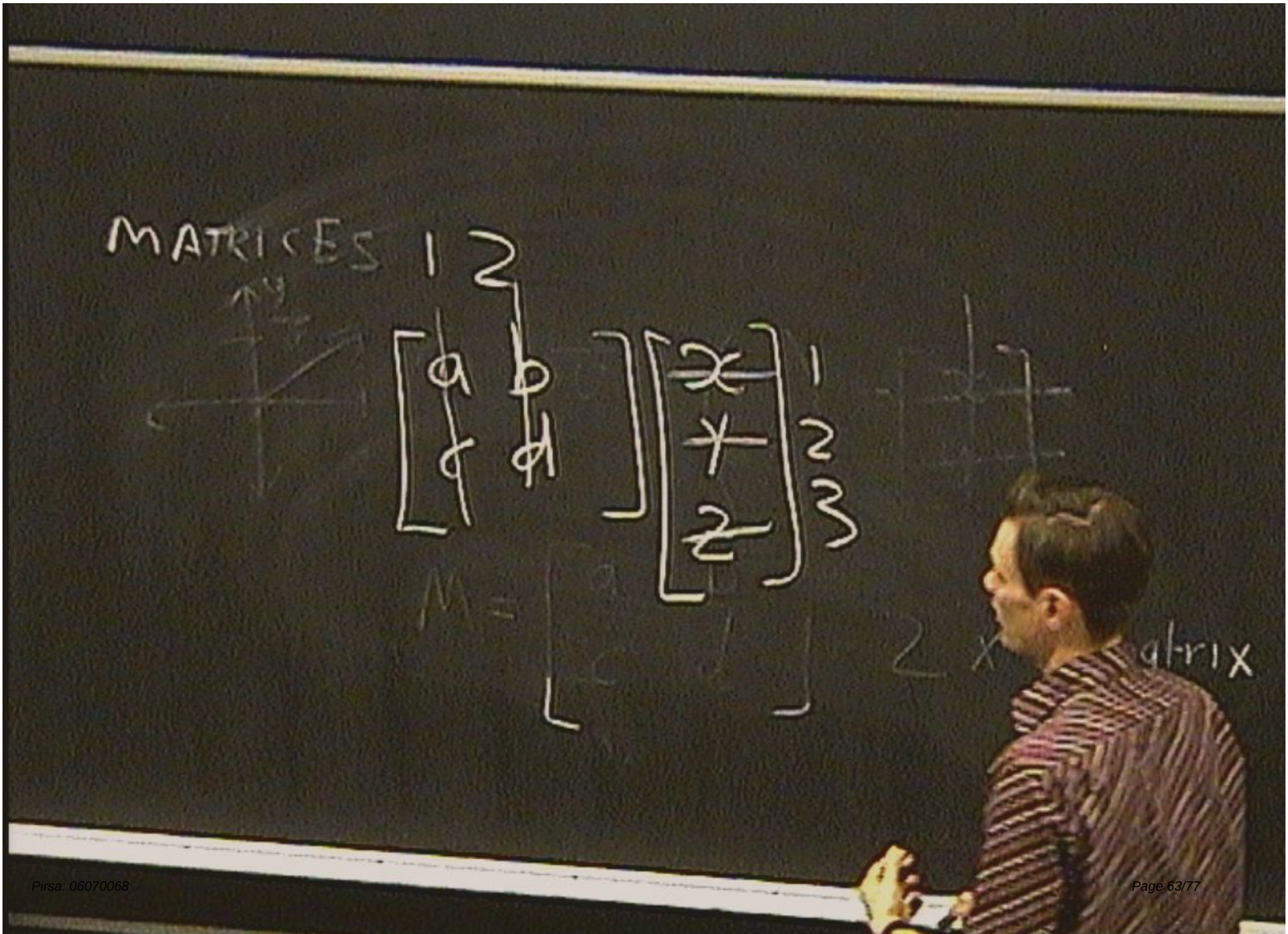
$$\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \end{bmatrix} = \begin{bmatrix} 2+3 \\ 1+9 \end{bmatrix} = \begin{bmatrix} 5 \\ 10 \end{bmatrix}$$

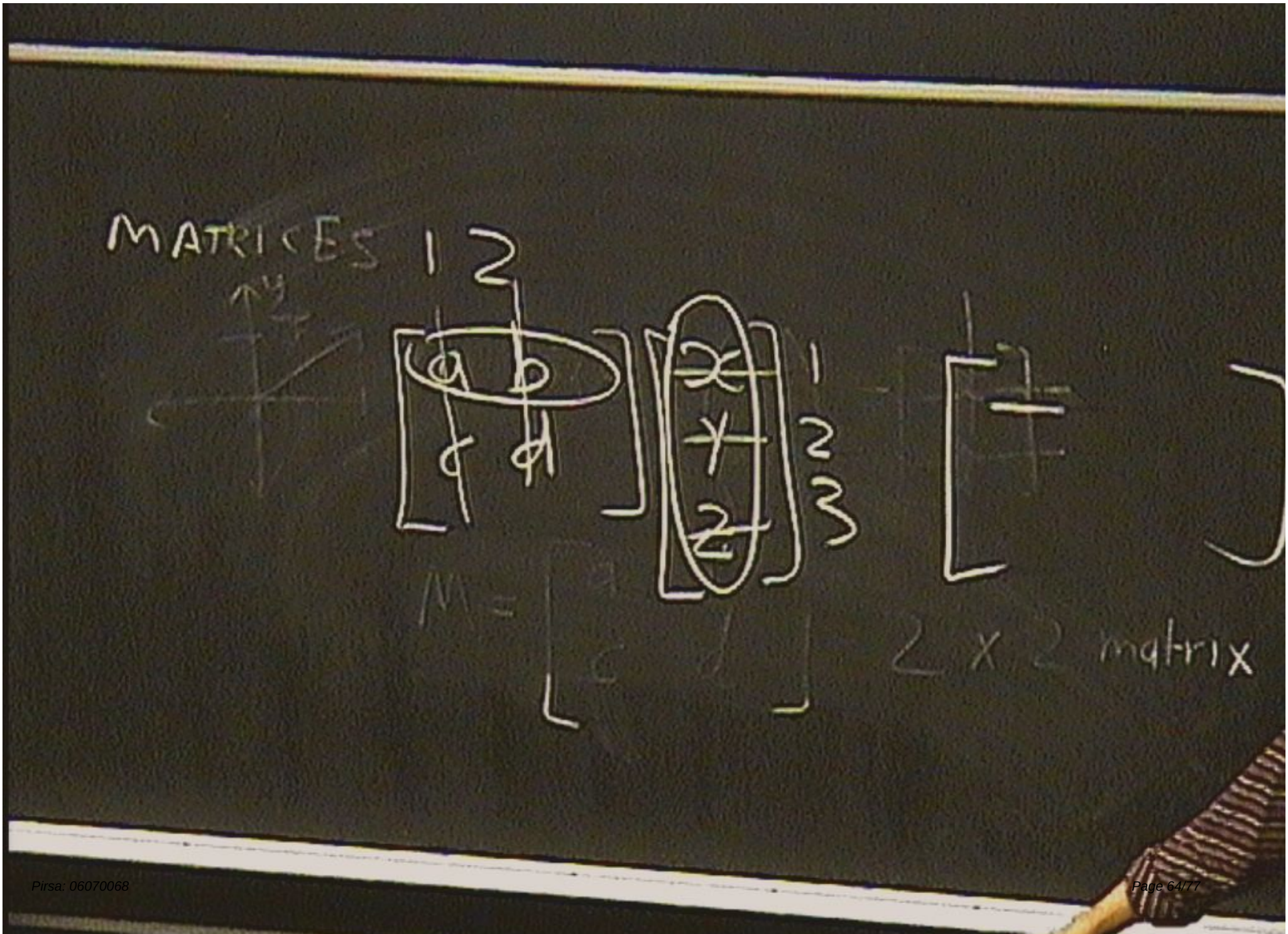


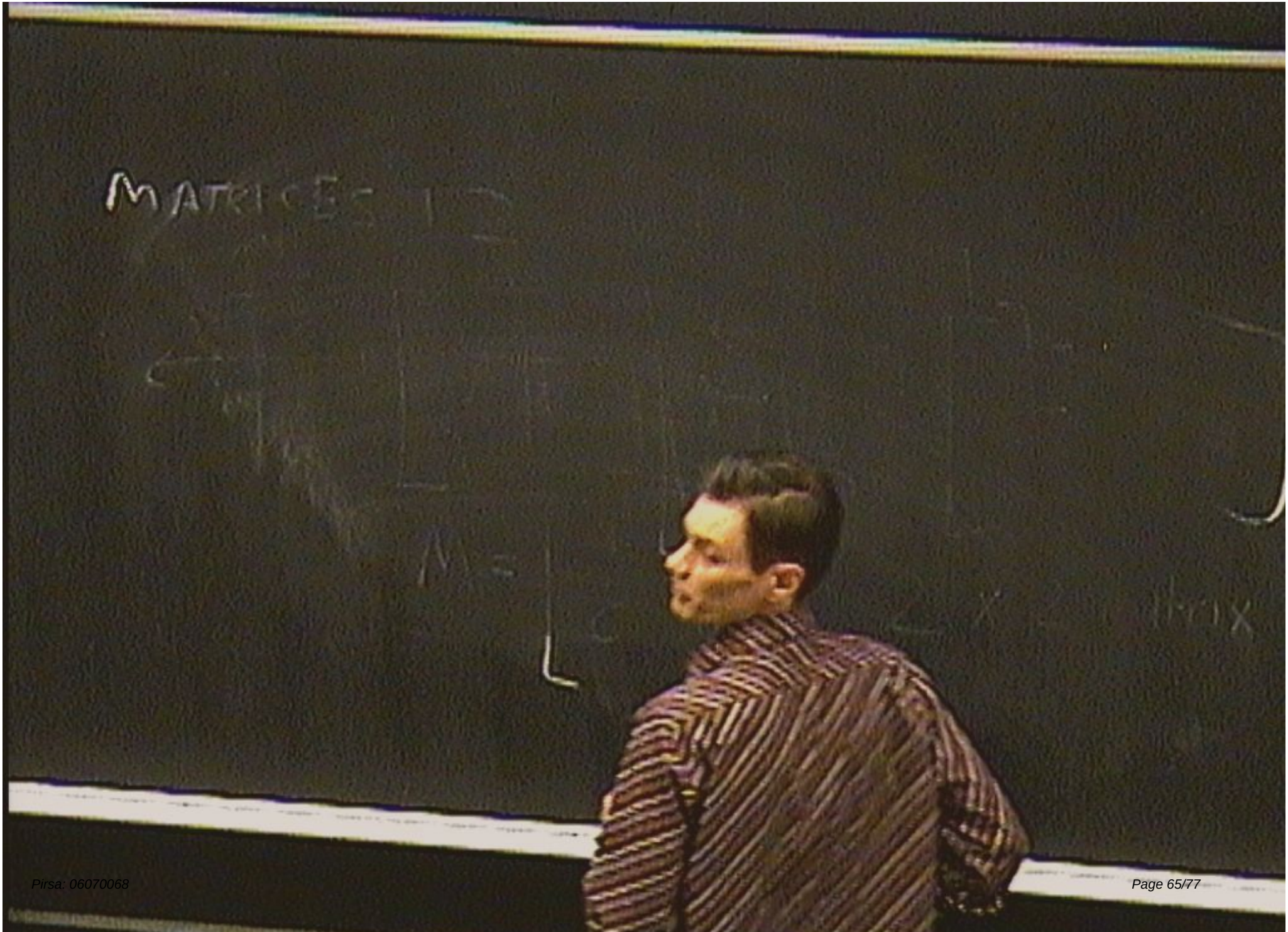

n columns
b columns
m rows
x
n rows
=

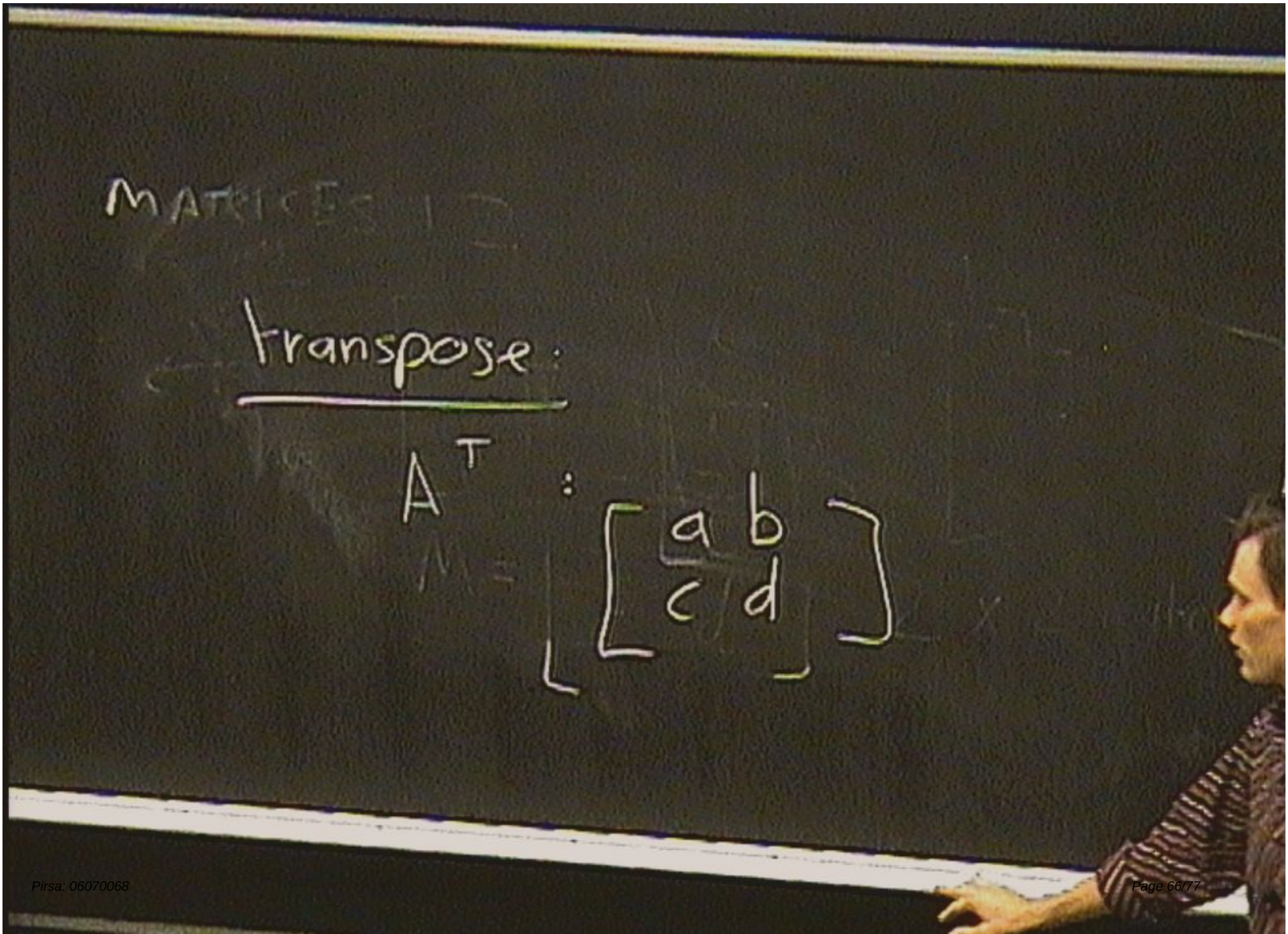

m
rows
n
rows
=
no. of columns in first =
no. of columns in

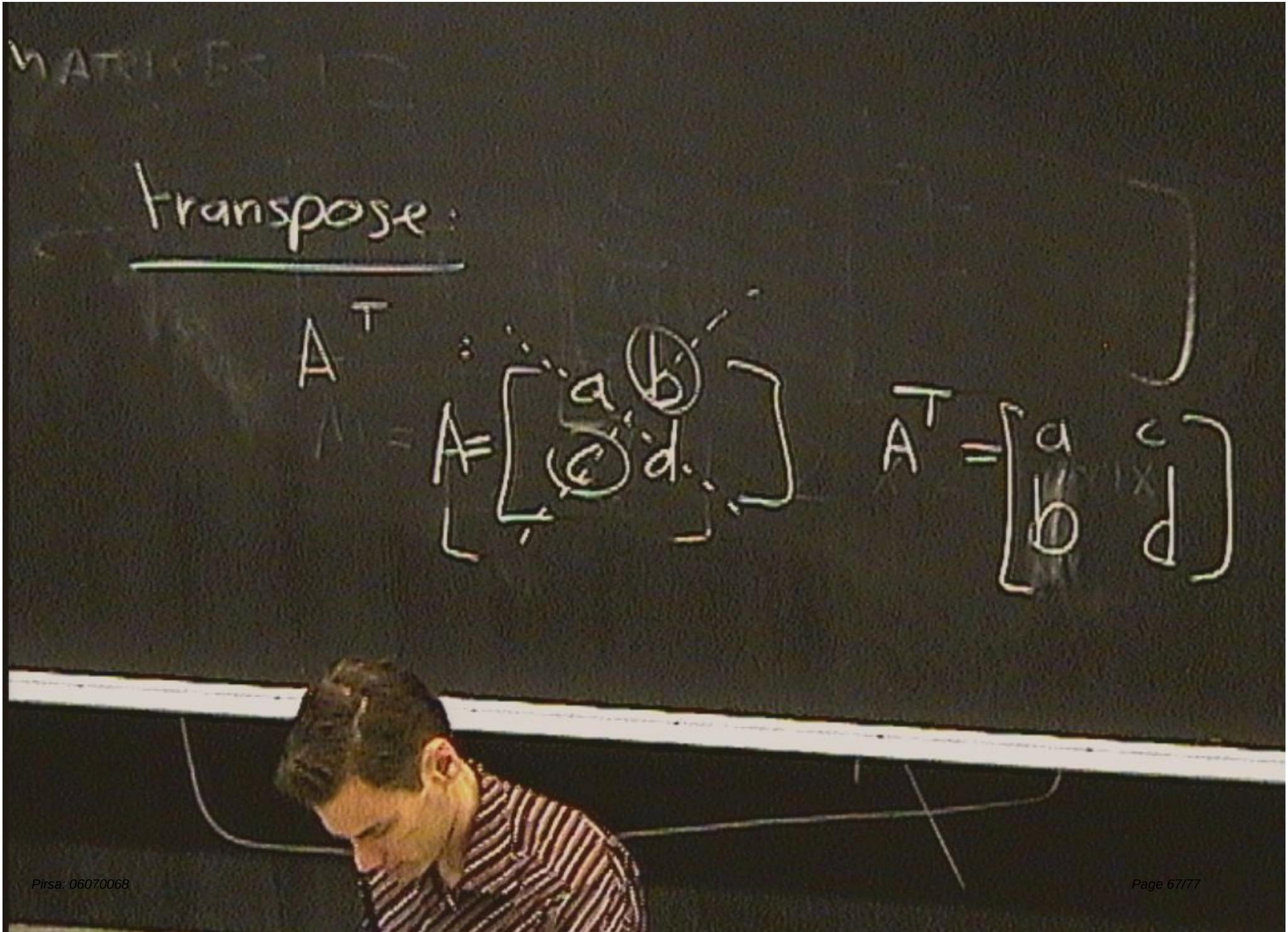

m
rows
n
rows
=
no. of columns in first =
no. of rows. in 2ND


MATRICES
1 2
a b
c d
x
y
z
1
2
3
M =
2 x
atrix


MATRICES
1 2
a b
c d
x
y
z
1
2
3
2 x 2 matrix


MATRICE


transpose:
A^T :
$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$


Transpose:
A^T
$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$
$A^T = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$

MATRICES - 1

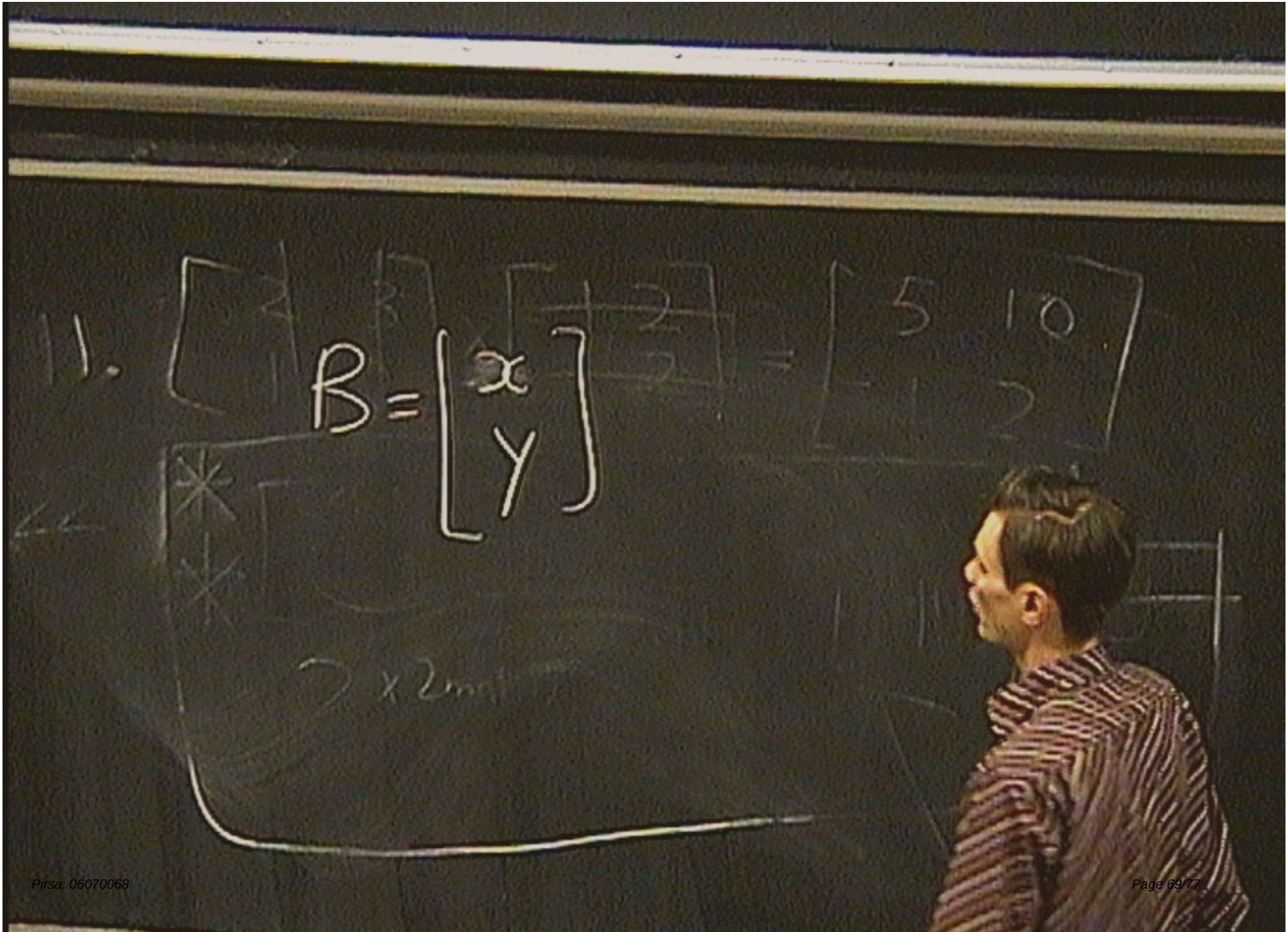
$$A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$$

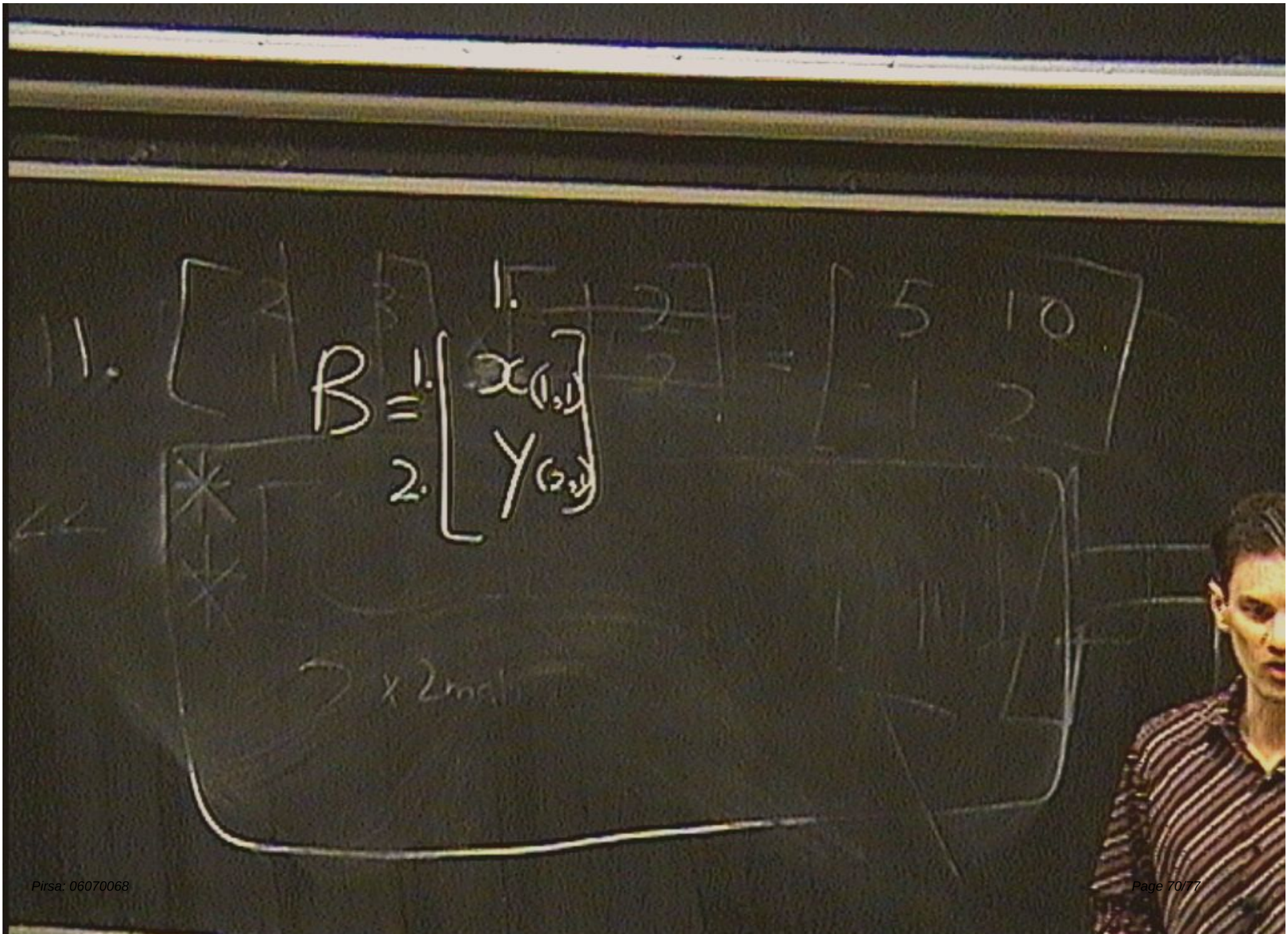
transpose:

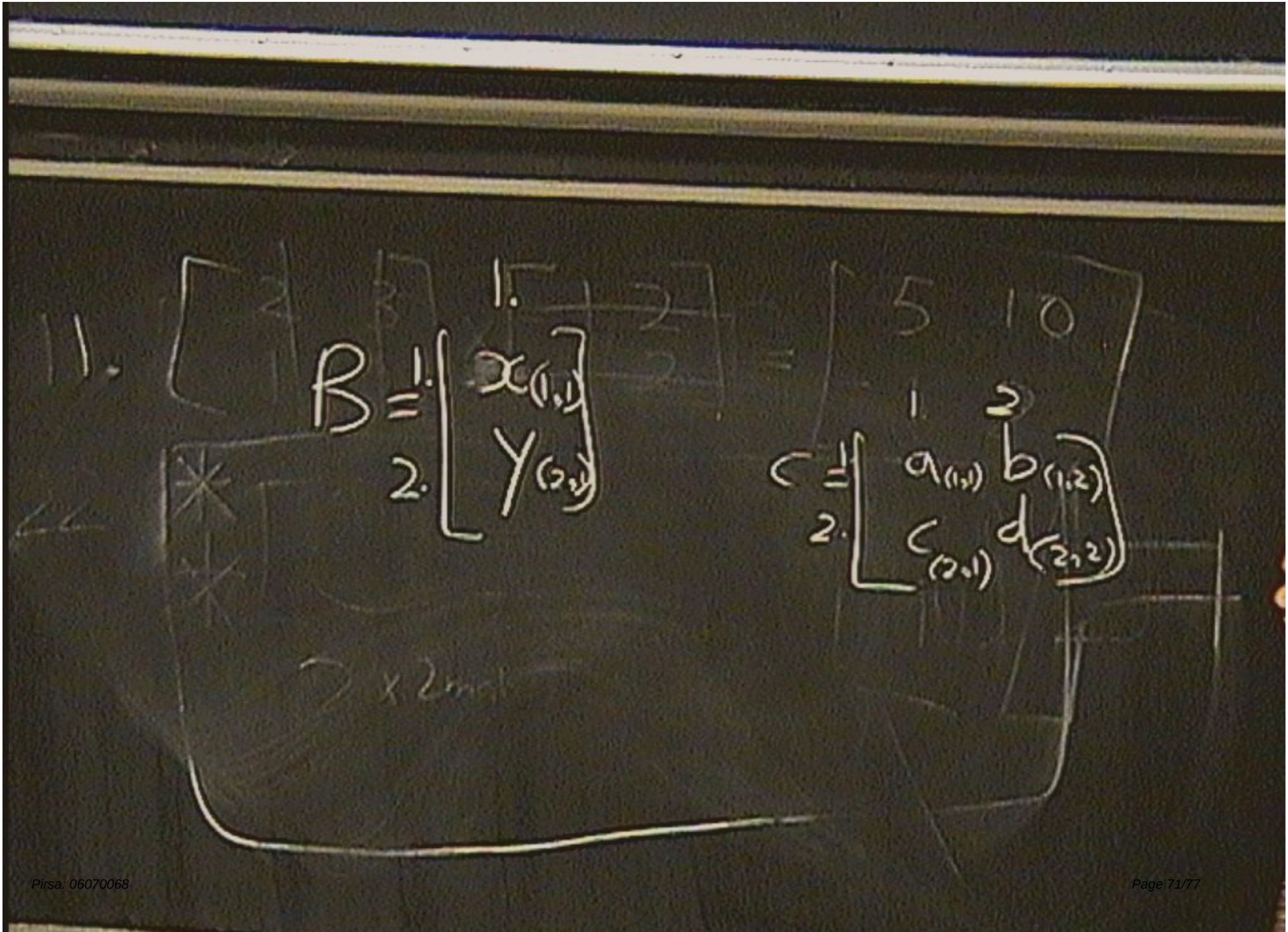
$$\therefore A^T = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$

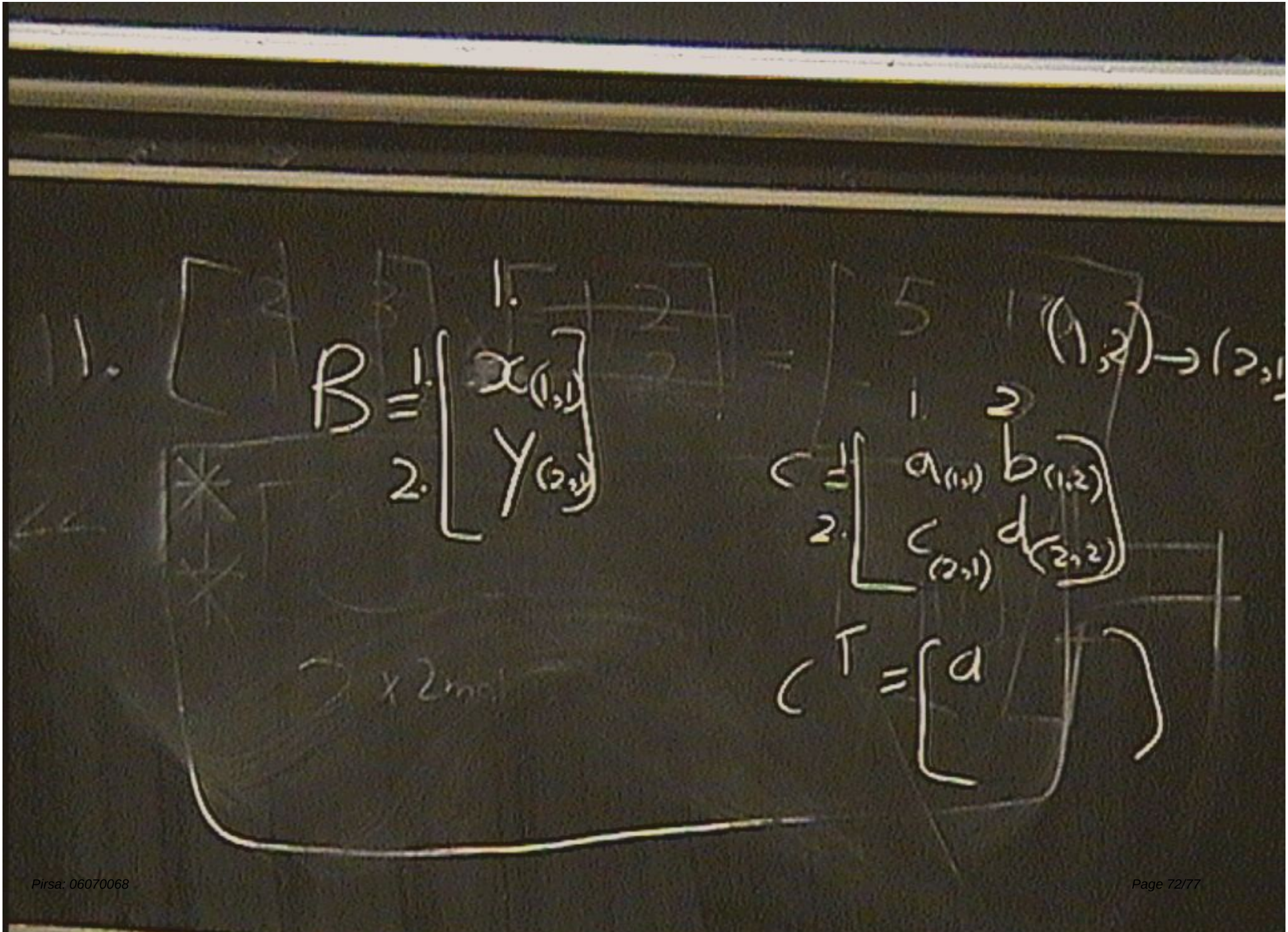
A^T :

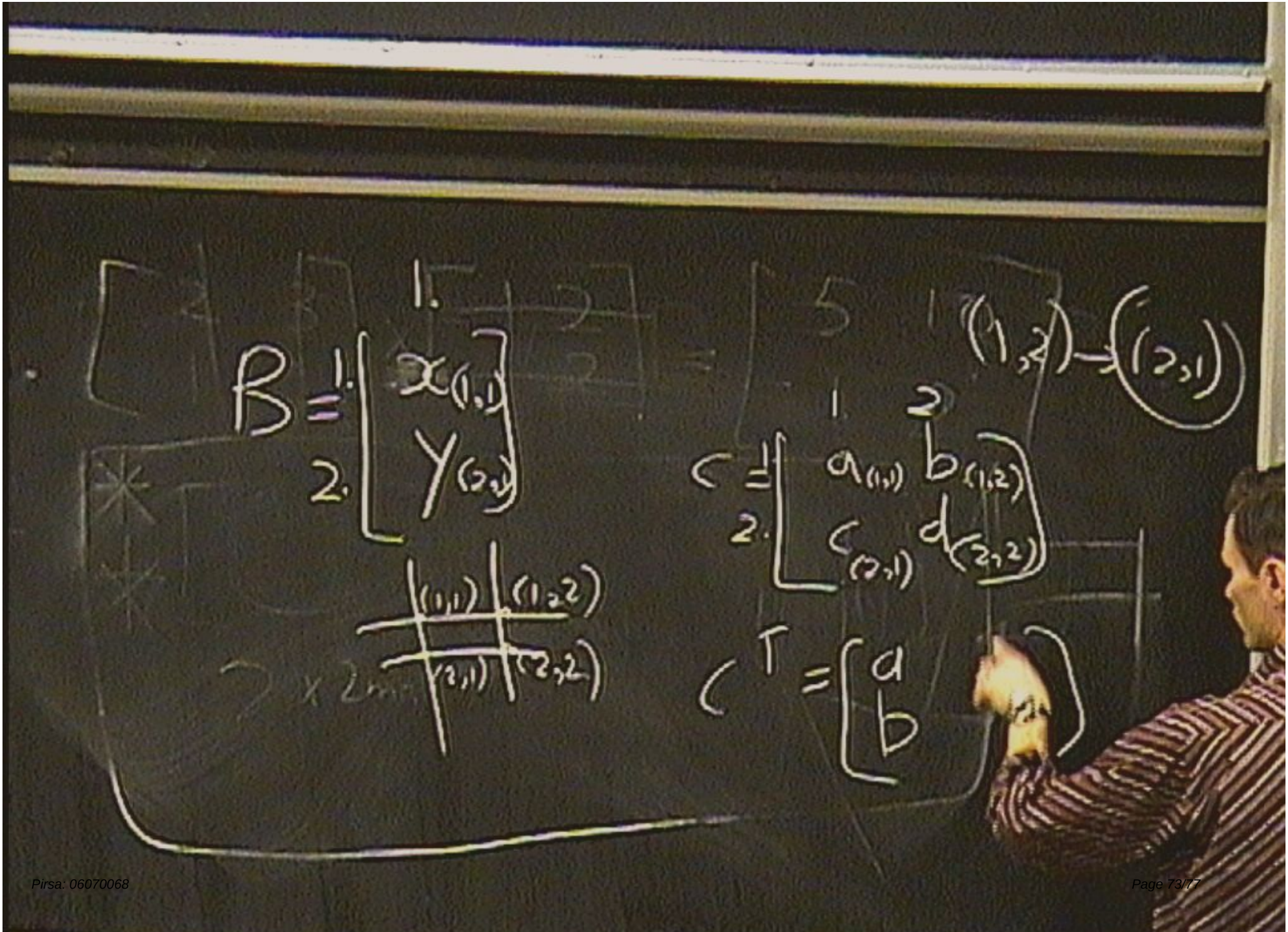
$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \qquad A^T = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$$

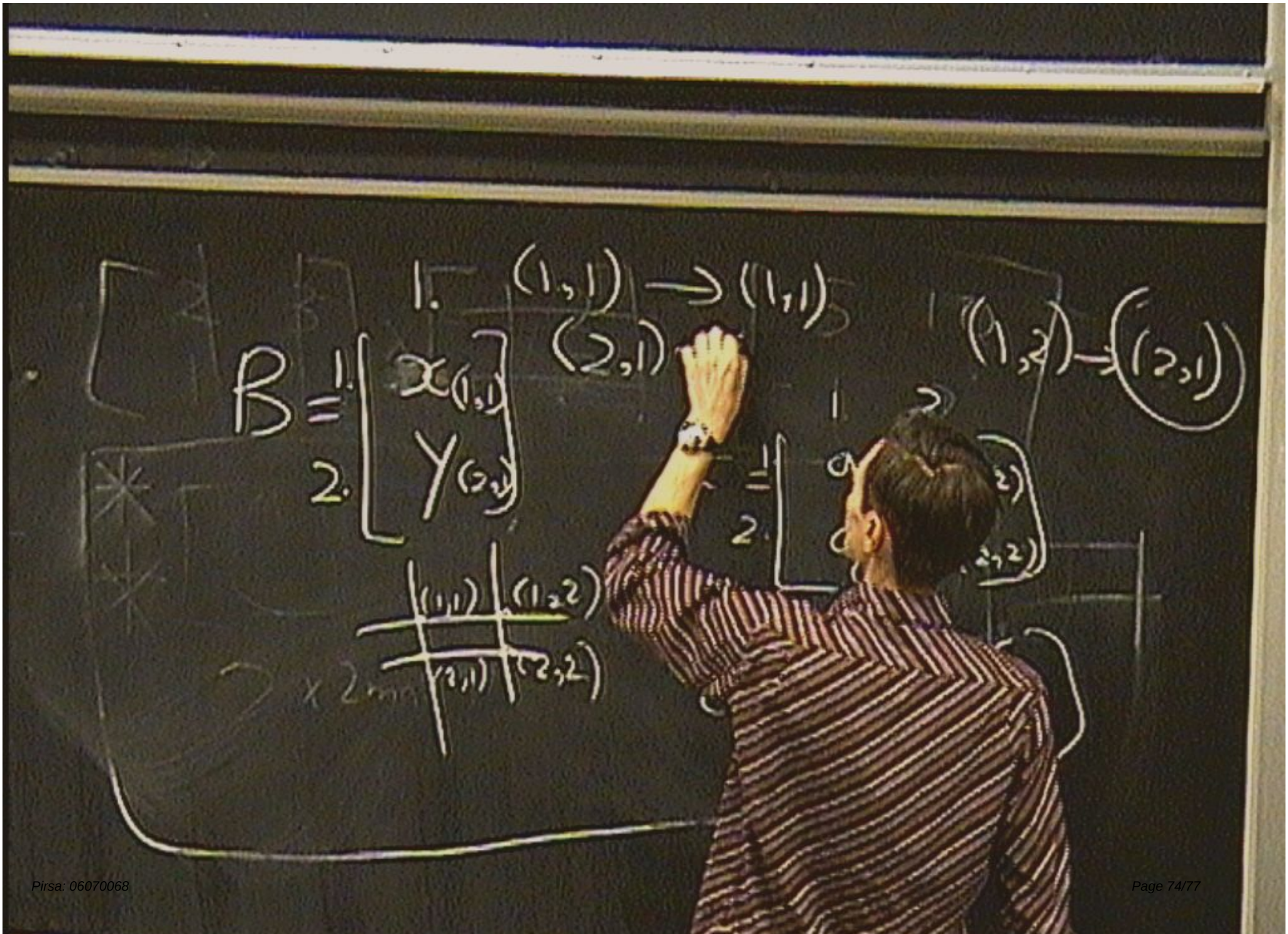

B = [x y]

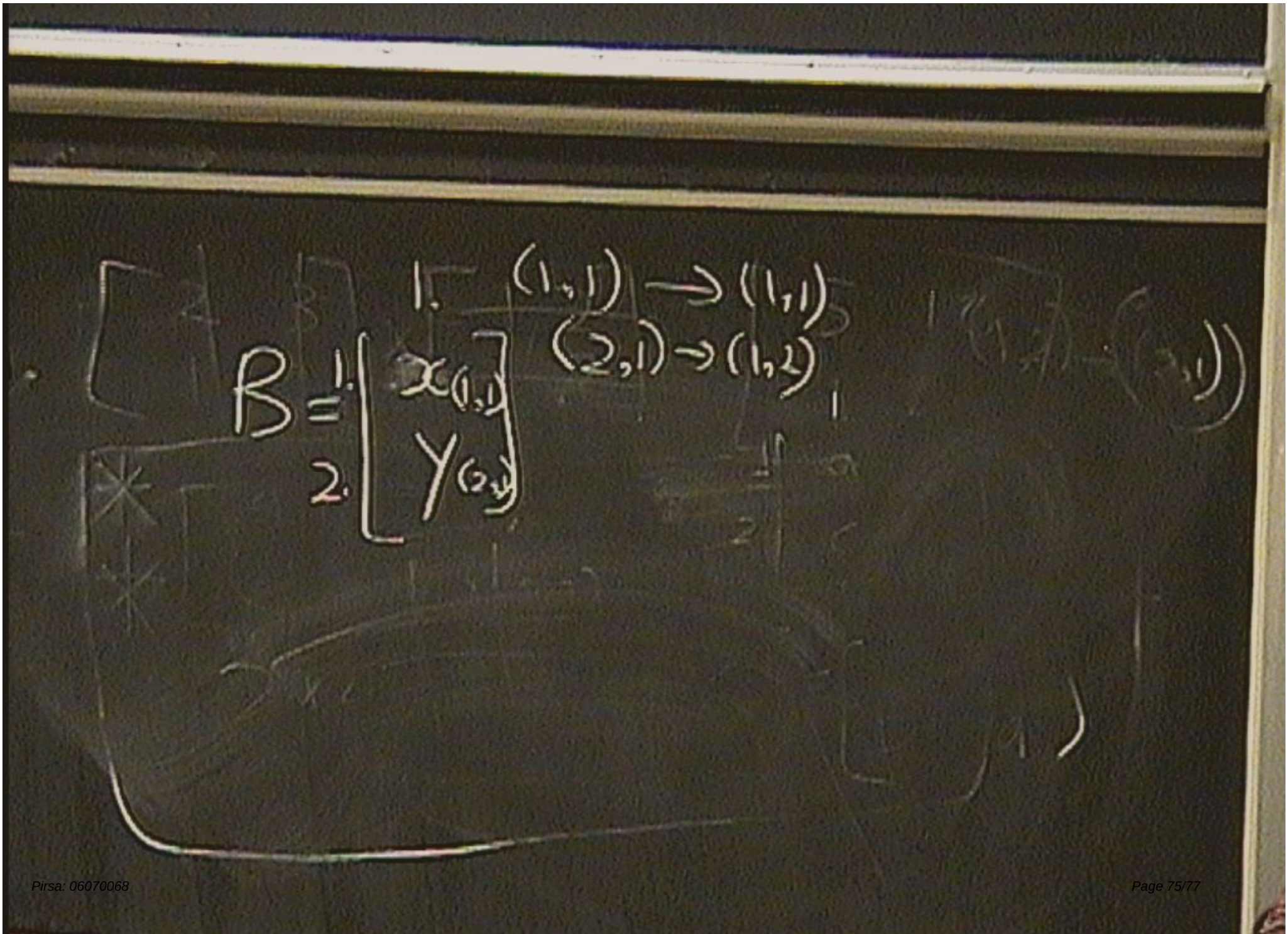

1.
B = 1. [x(1,1)]
2. [Y(2,1)]
2 x 2 matrix

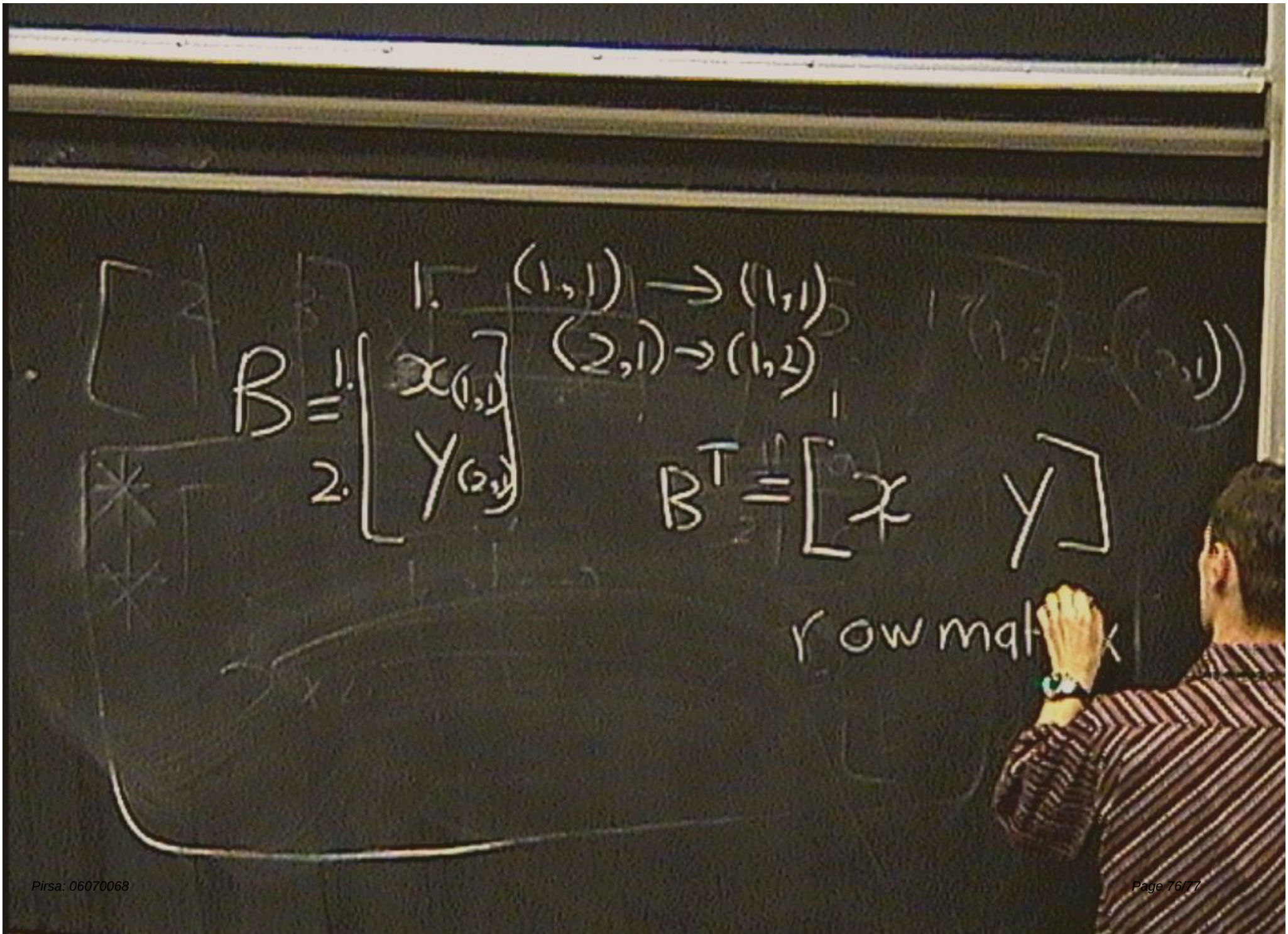

B
C
2 x 2n-1

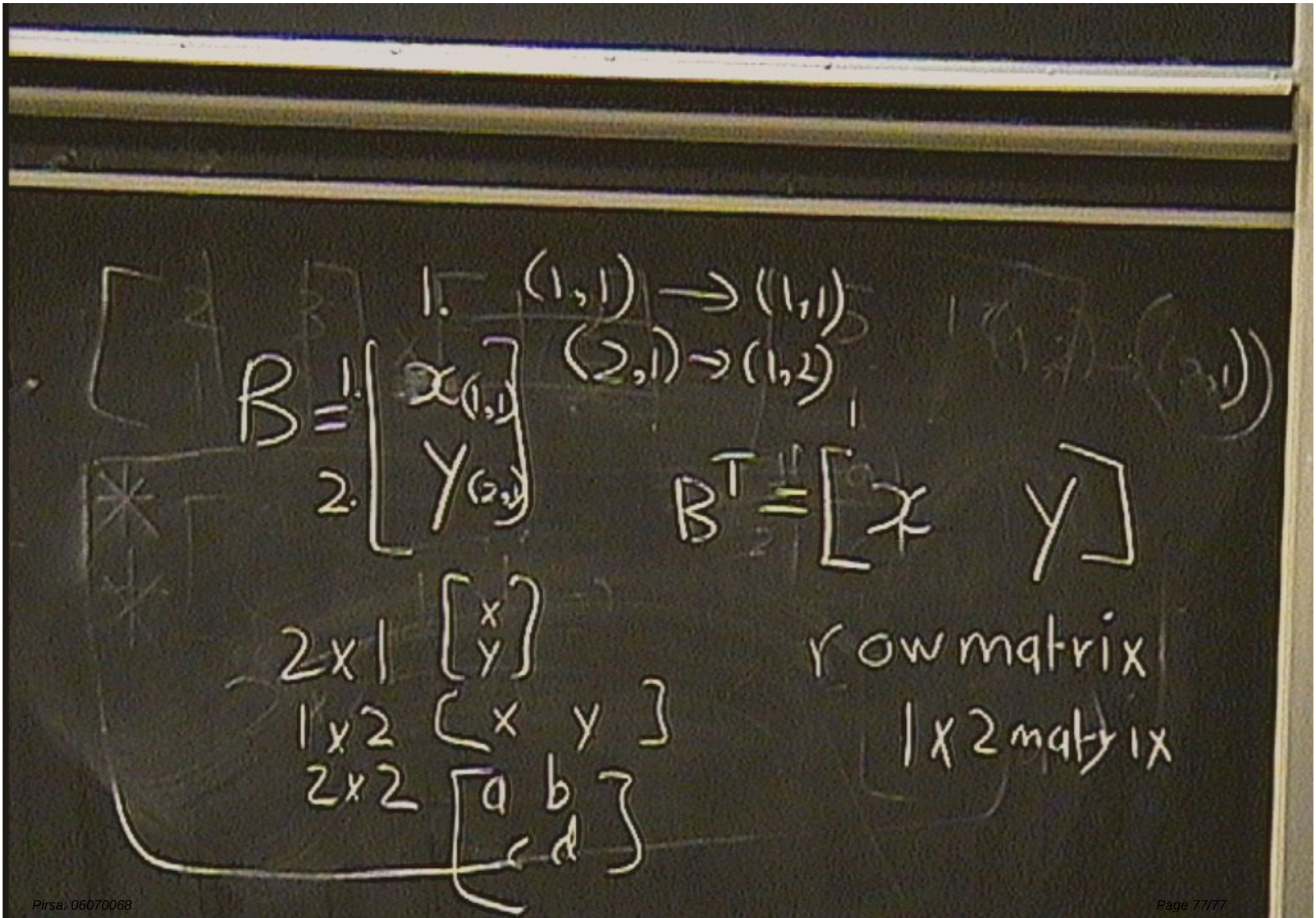

B
C
C^T


B =
C =
C^T =
(1,1) (1,2)
(2,1) (2,2)


1. (1,1) → (1,1)
(2,1)
B = 1. X(1,1)
2. Y(2,1)
(1,2) → (2,1)
1 2
1
2
(1,1) (1,2)
(2,1) (2,2)


1. (1,1) → (1,1)
(2,1) → (1,2)
B = 1. [x(1,1)]
2. [y(2,1)]


1. (1,1) → (1,1)
(2,1) → (1,2)
B = 1. x(1,1)
2. y(2,1)
B^T = [x y]
row mat


1. (1,1) → (1,1)
(2,1) → (1,2)
B = 1. [x(1,1)]
2. [y(2,1)]
B^T = [x y]
2x1 [x y]
1x2 [x y]
2x2 [a b c d]
row matrix
1x2 matrix