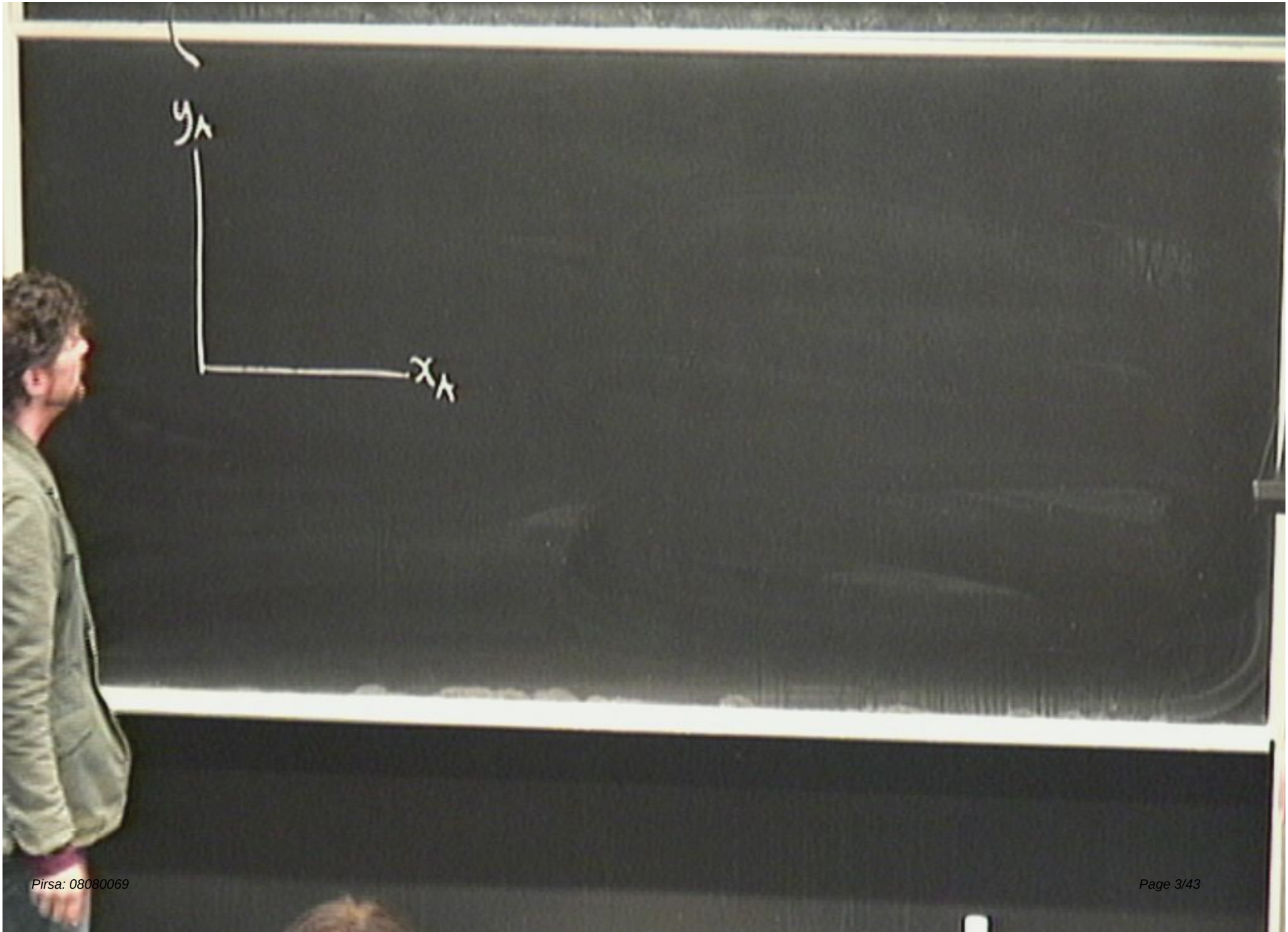
Title: Special Relativity 10 - Coordinate Axes and Length Contraction

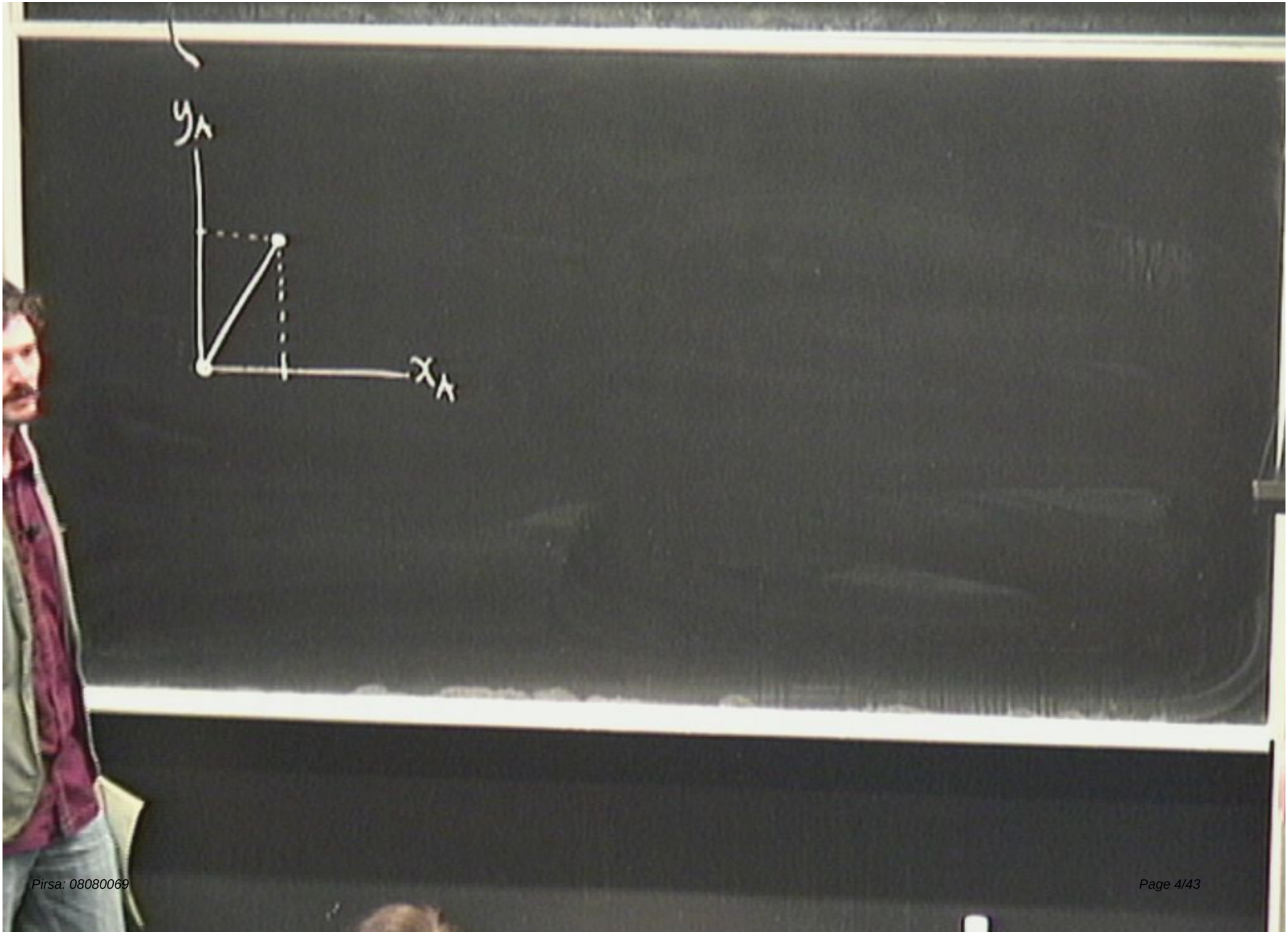
Date: Aug 13, 2008 09:00 AM

URL: http://pirsa.org/08080069

Abstract: A discussion of the space and time axes of a moving observer and an introduction to length contraction.
Learning Outcomes:
â€¢ Understanding why and by how much a moving observerâ€™s position axis is â€œtilted in time.â€•
â€¢ Understanding how a moving platform appears to a stationary observer.
â€¢ Beginning to understand the cause of length contraction.

x_A
x_B
x_B'
x_B''
ct_B
ct_A


y_A
x_A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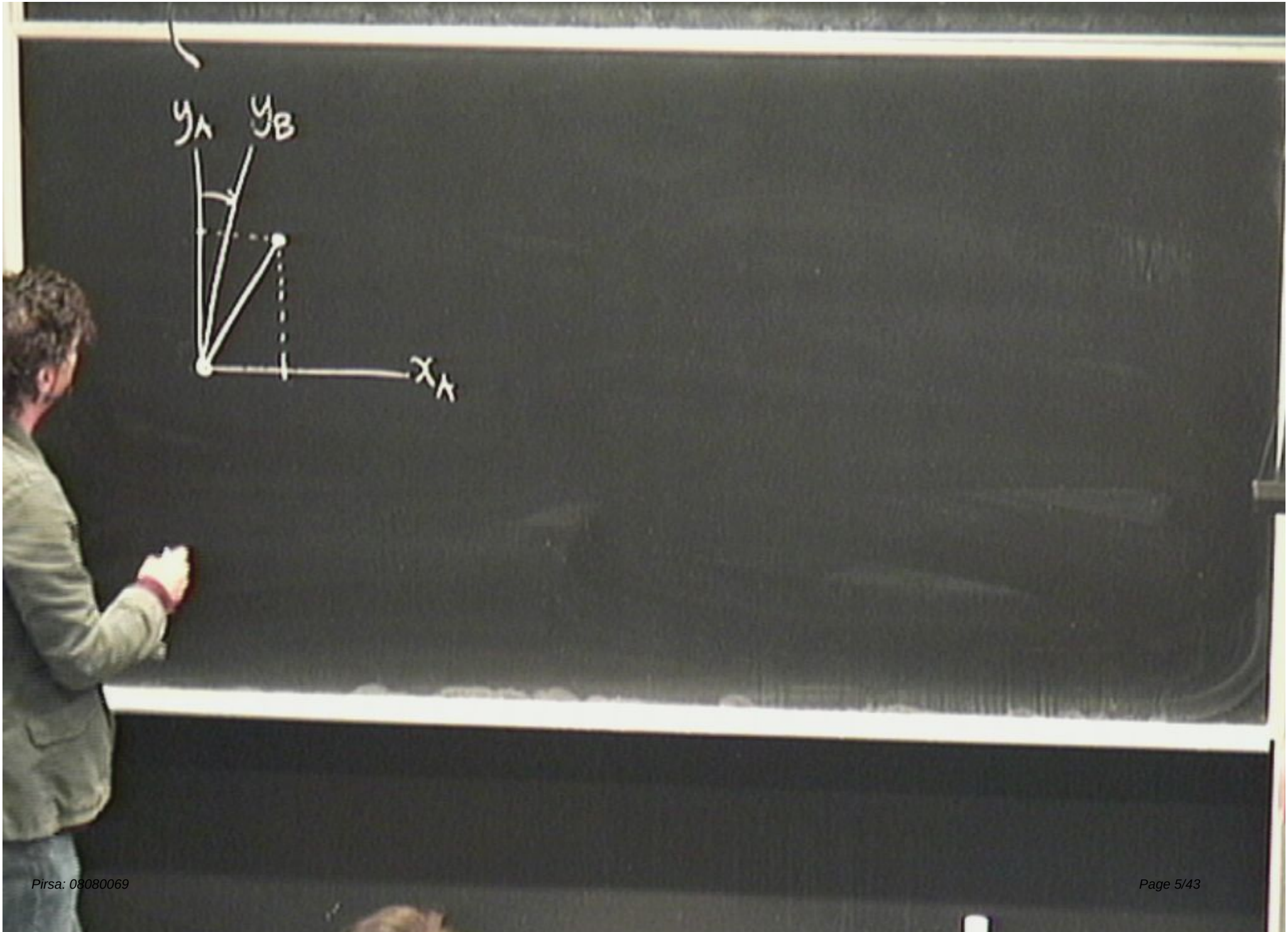
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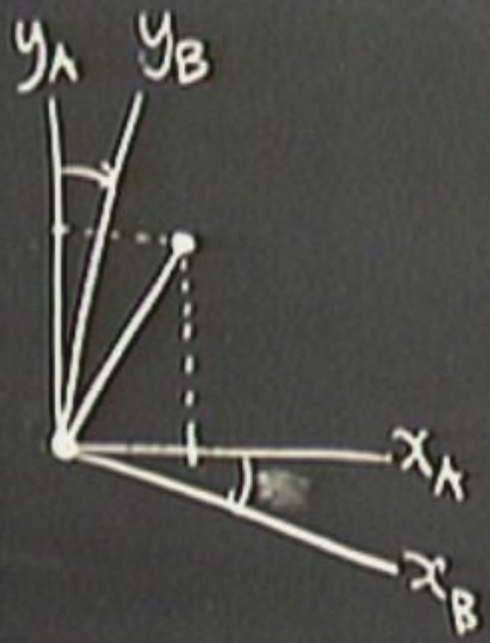
y_B
x_A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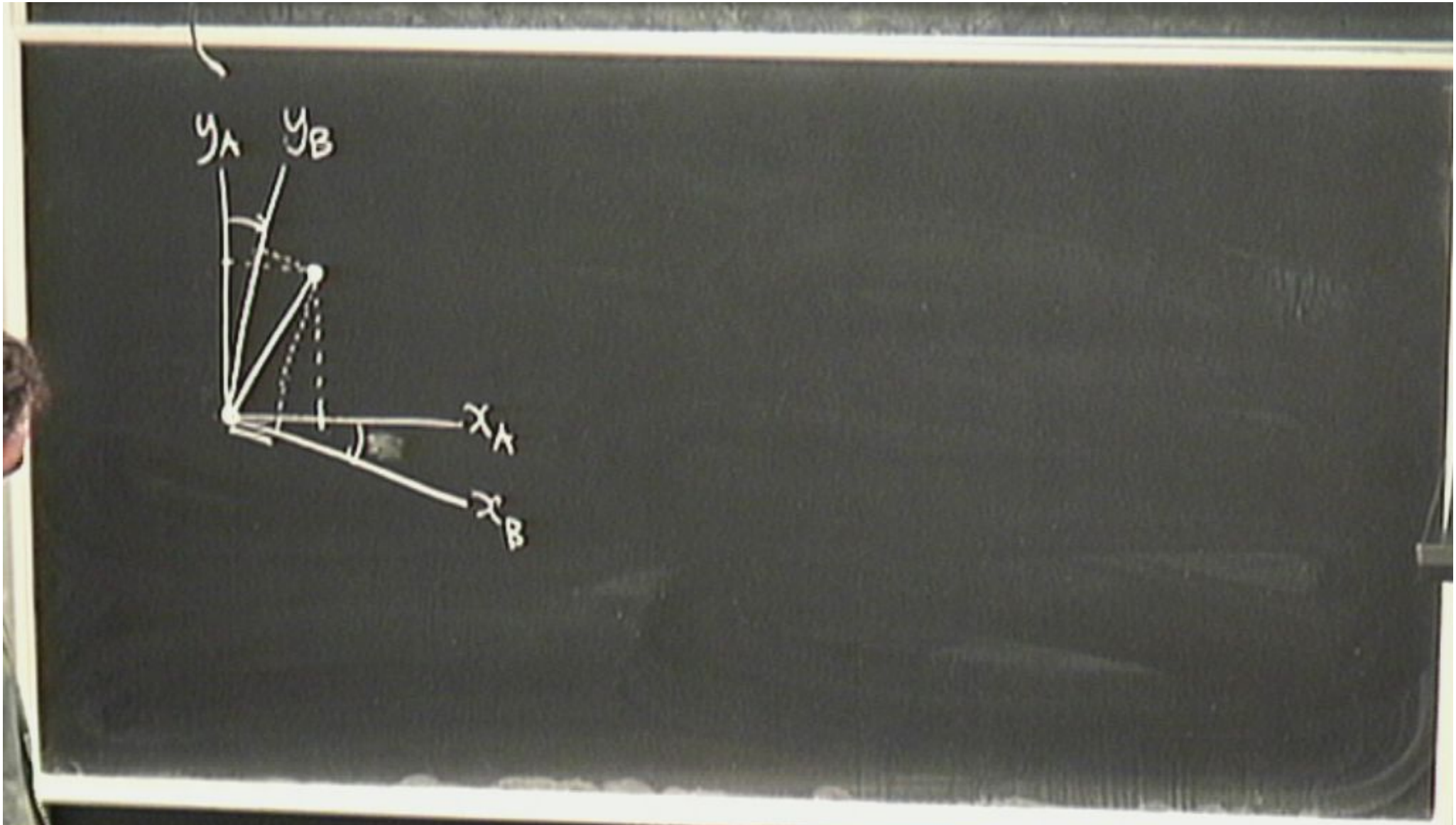
x_A
x_B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x_A
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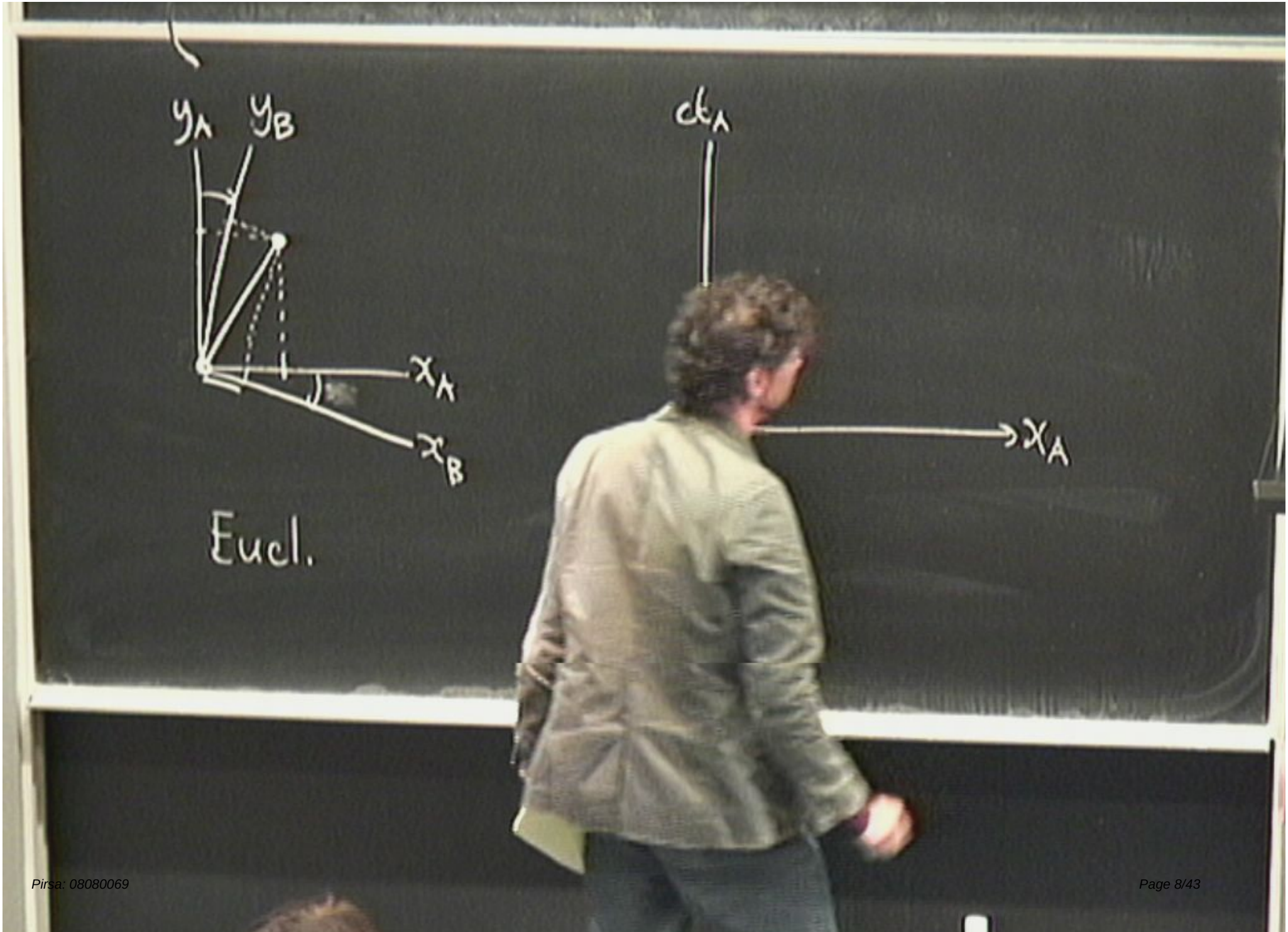
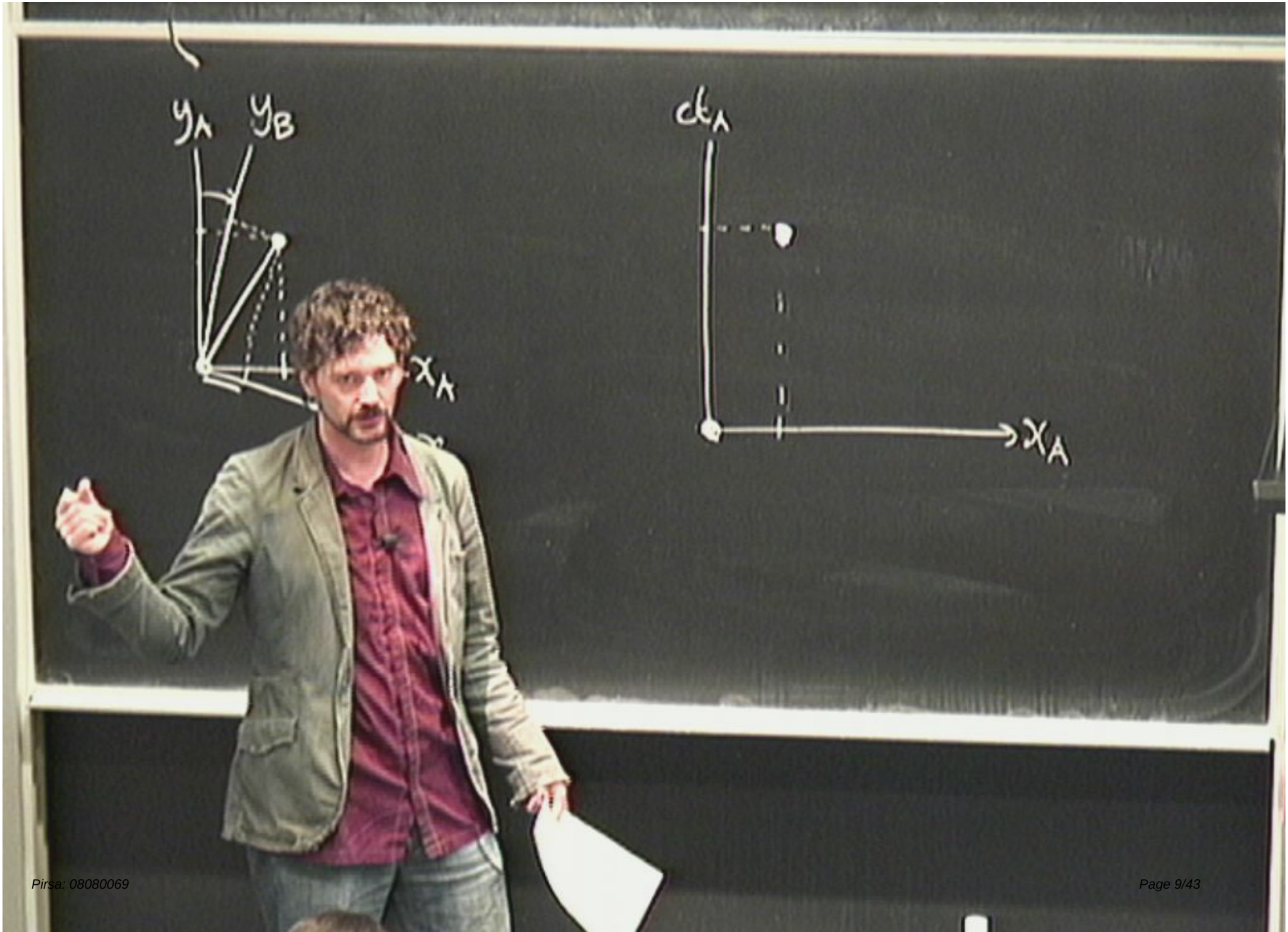

y_A y_B
x_A
x_B
Eucl.
ct_A
x_A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y_B
x_A
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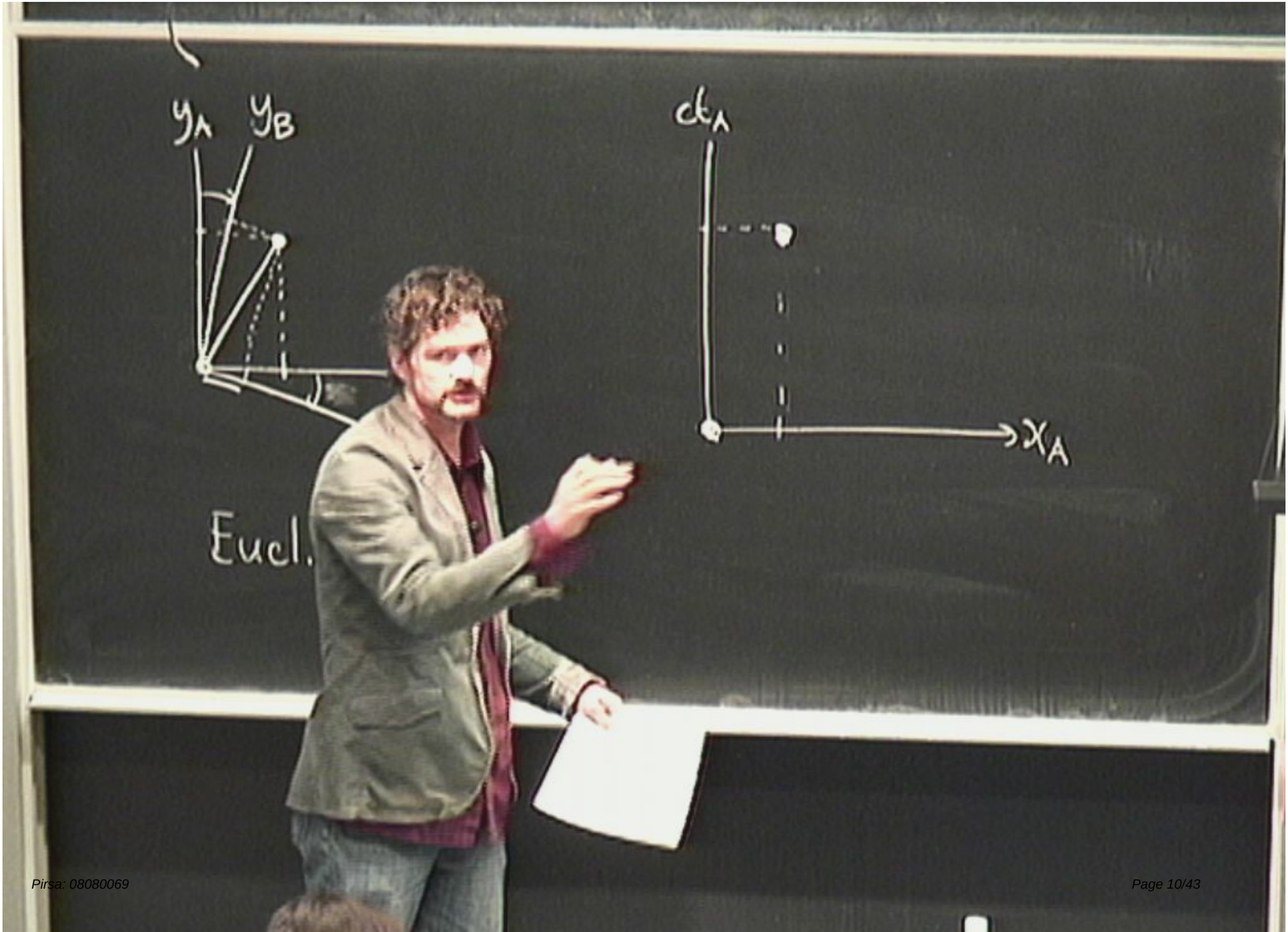
x_A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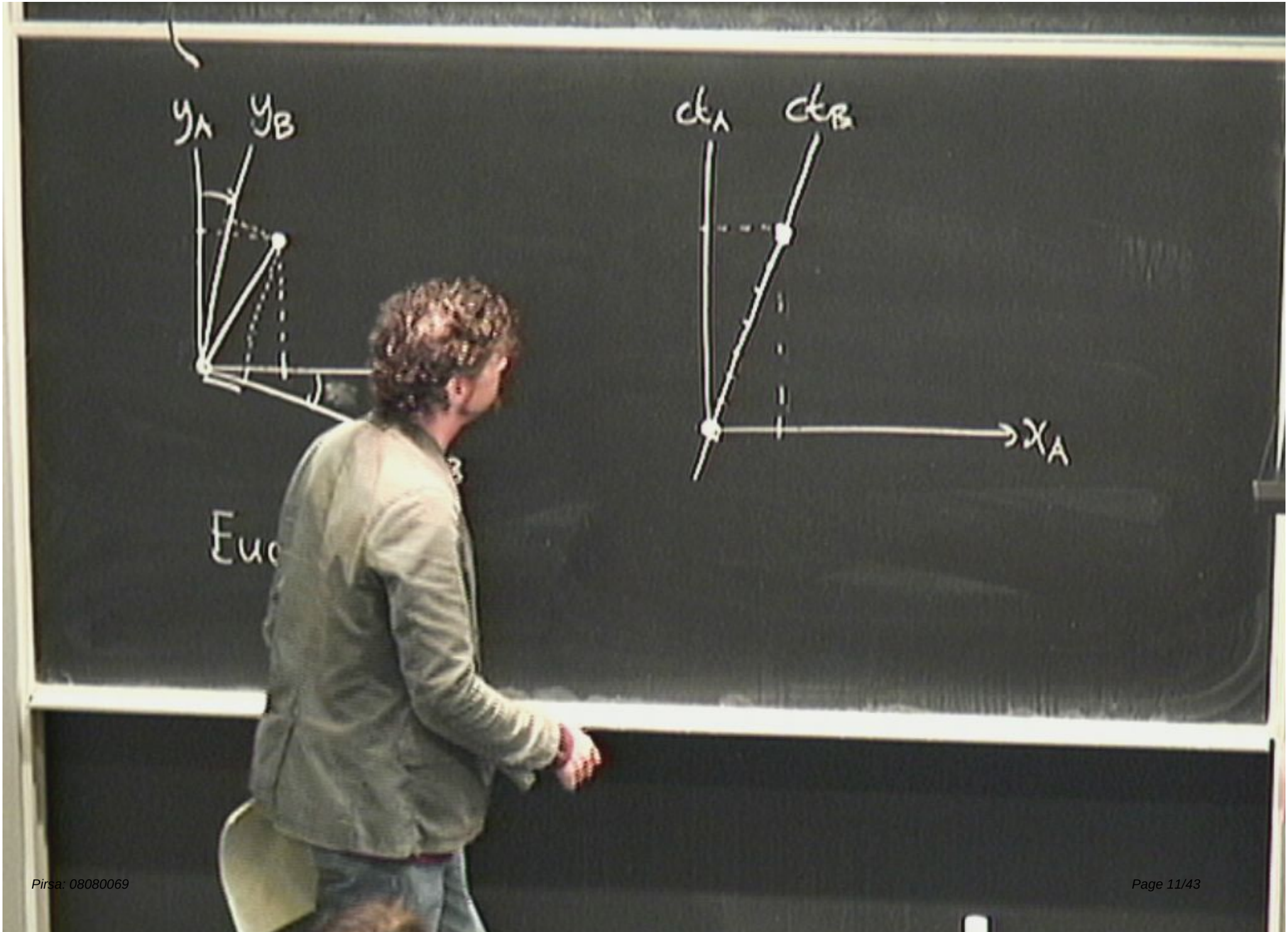
x_A
Eucl.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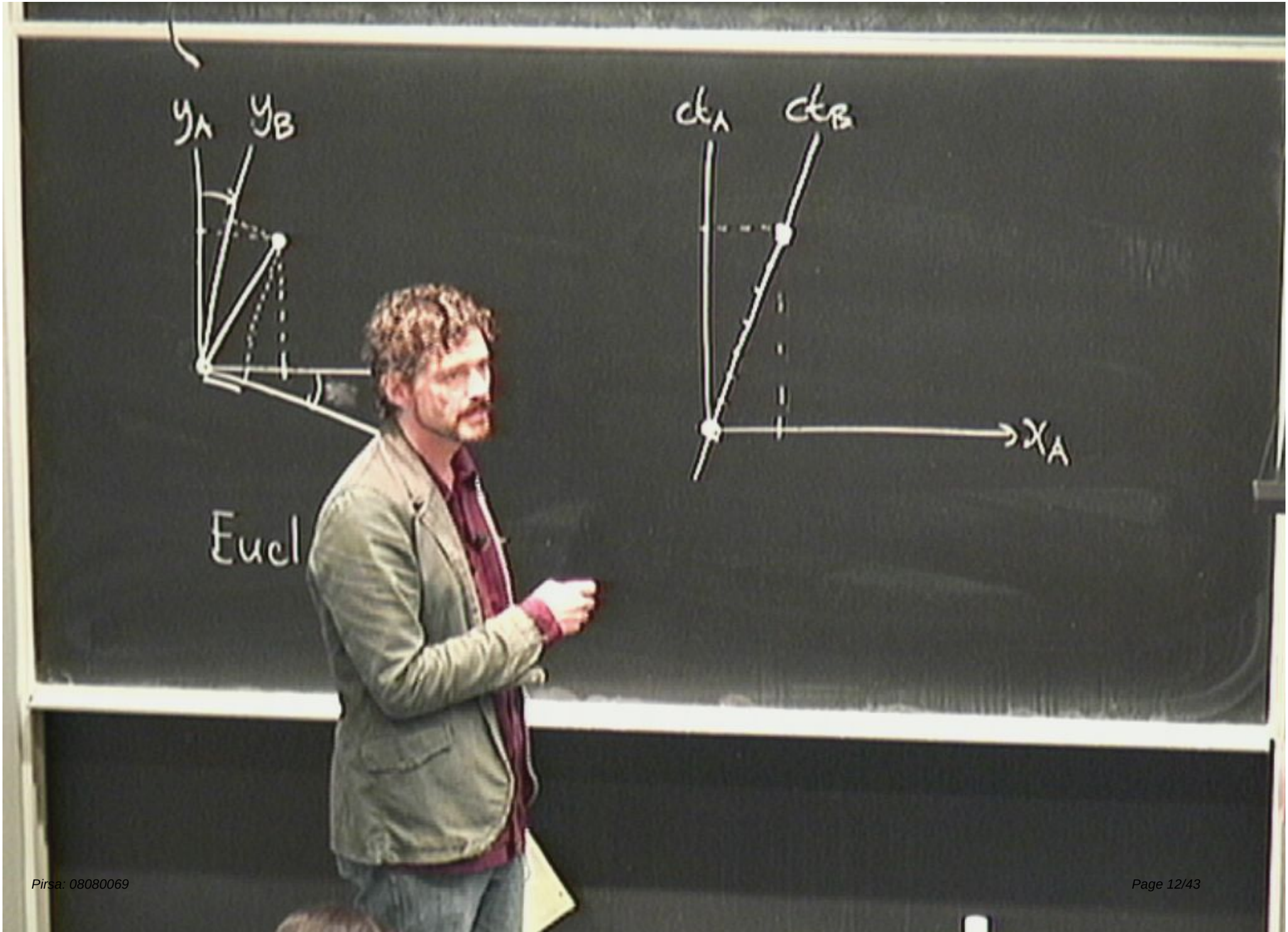
x_A
Euc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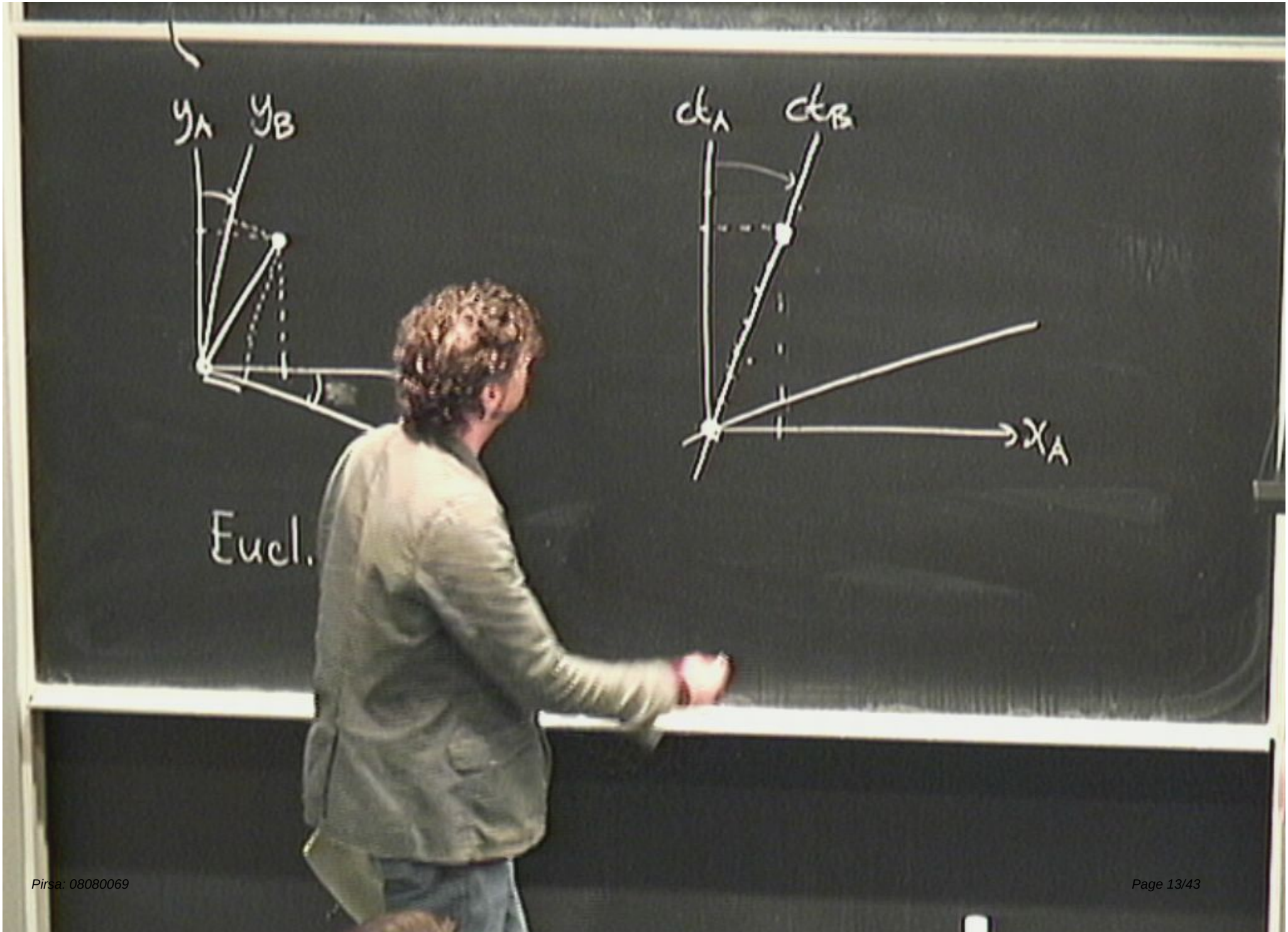
ct_A ct_B
x_A
Eucl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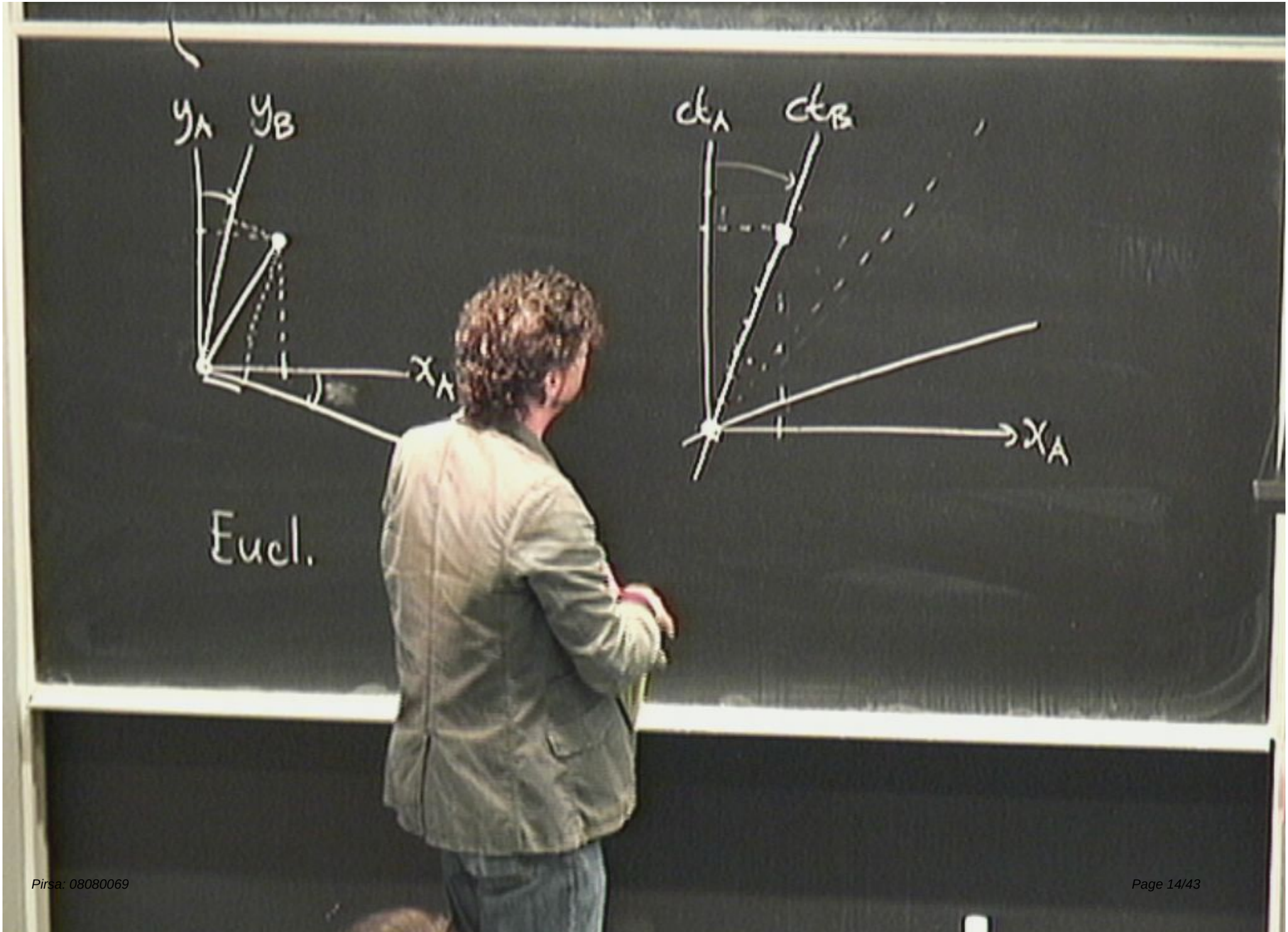
ct_A ct_B
x_A
Eucl.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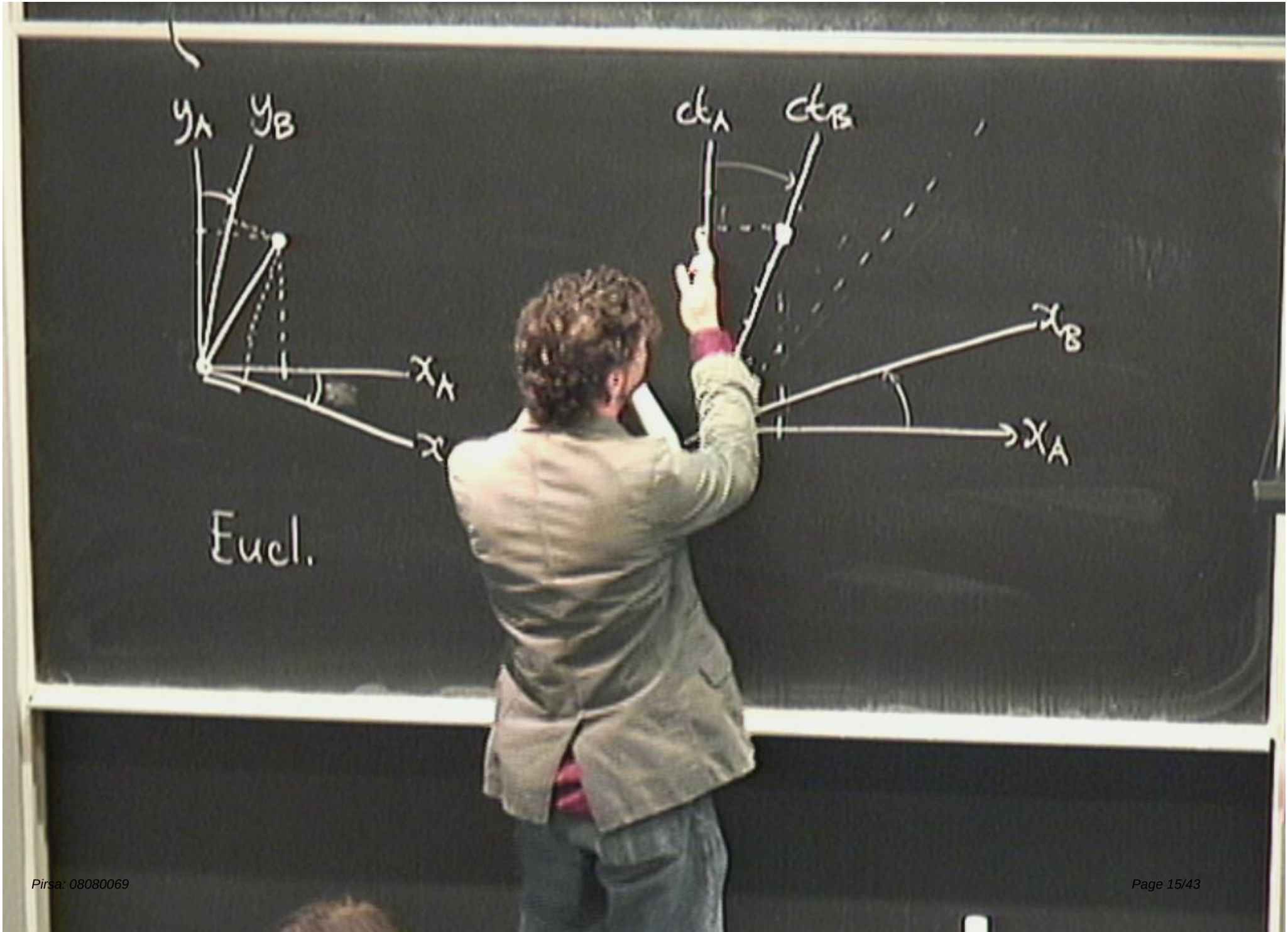
x_A
ct_A ct_B
x_A
Eucl.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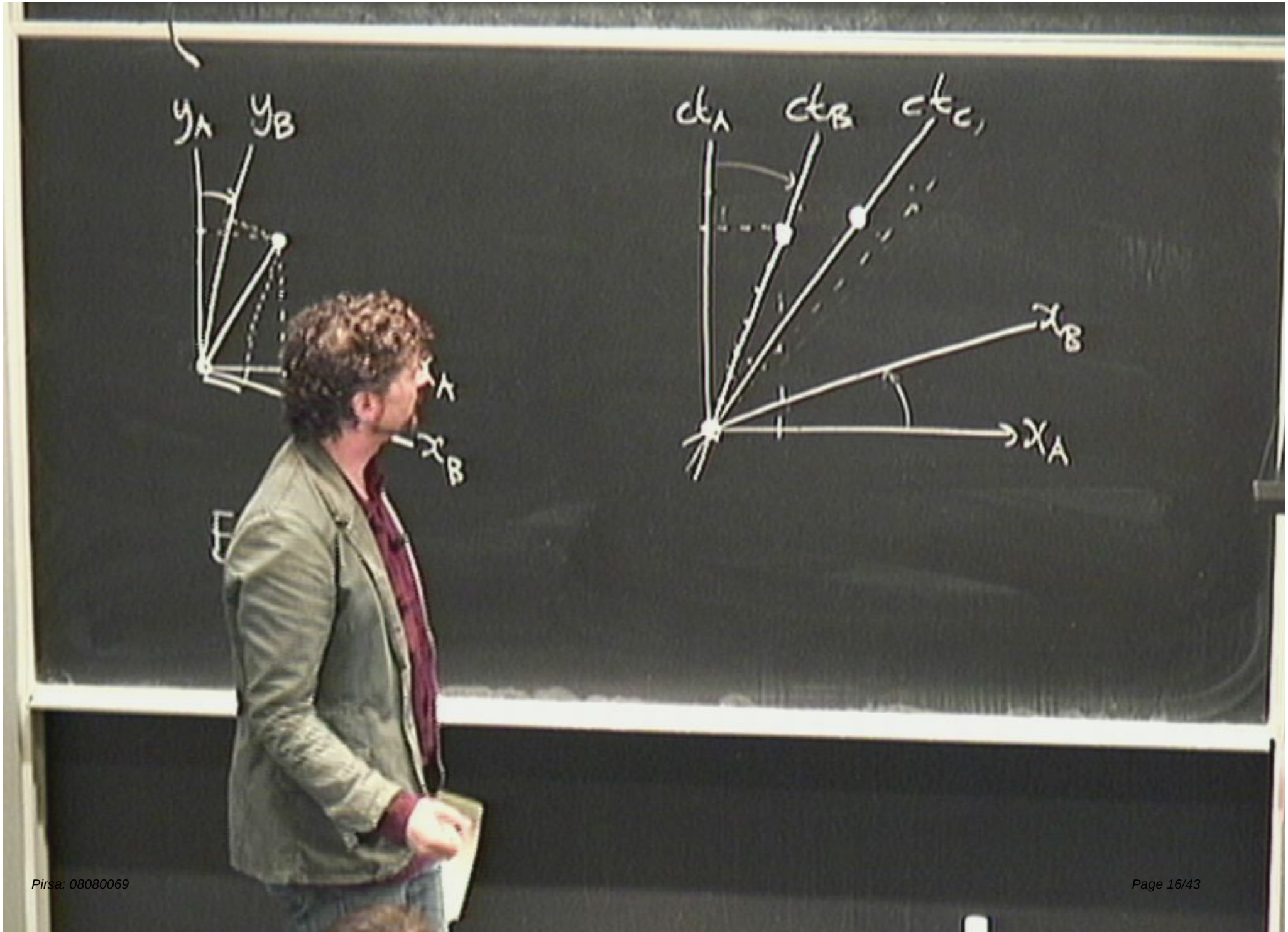
x_A
x
x_B
x_A
Eucl.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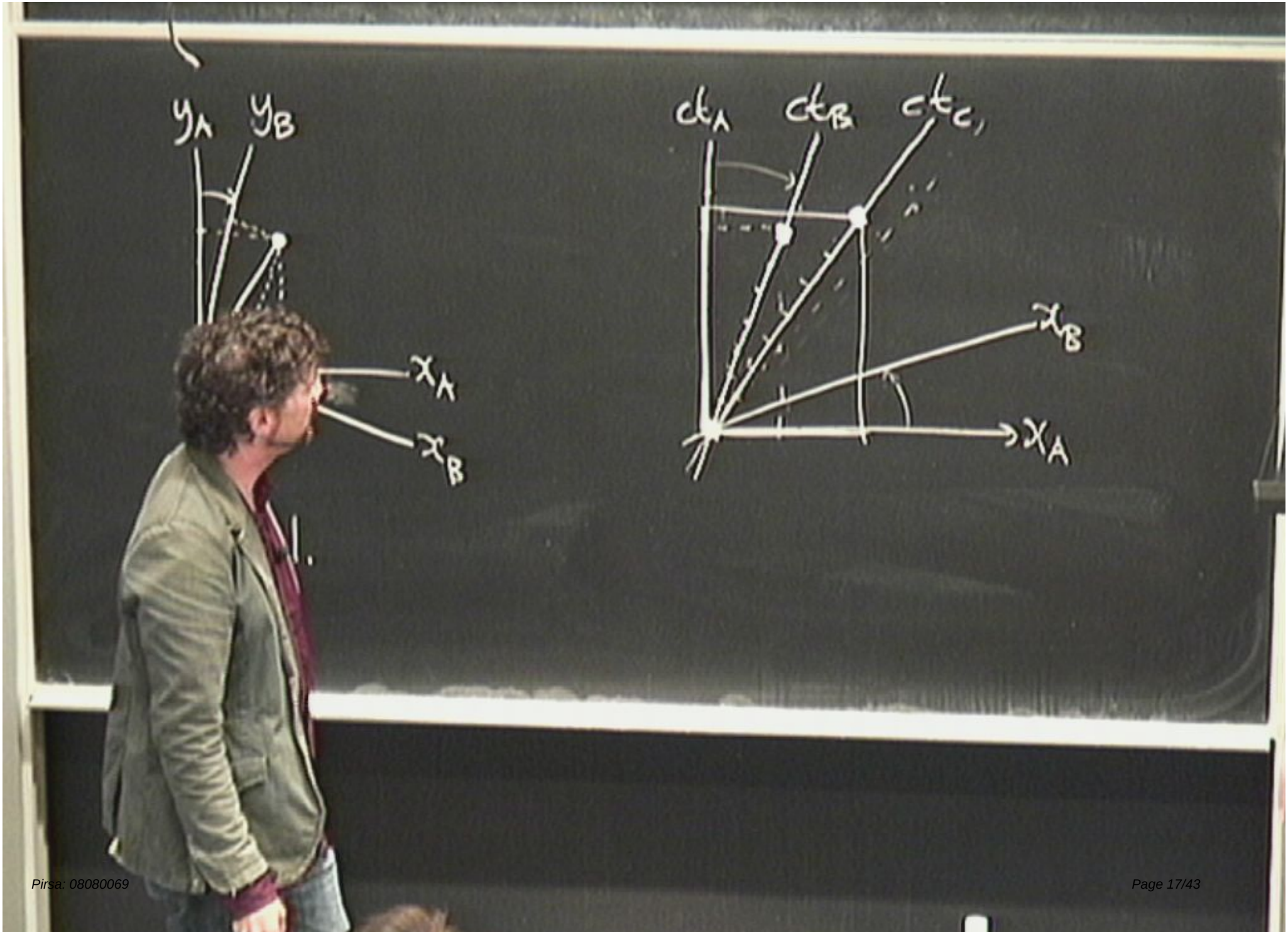
x_A
x_B
ct_A ct_B ct_C
x_B
x_A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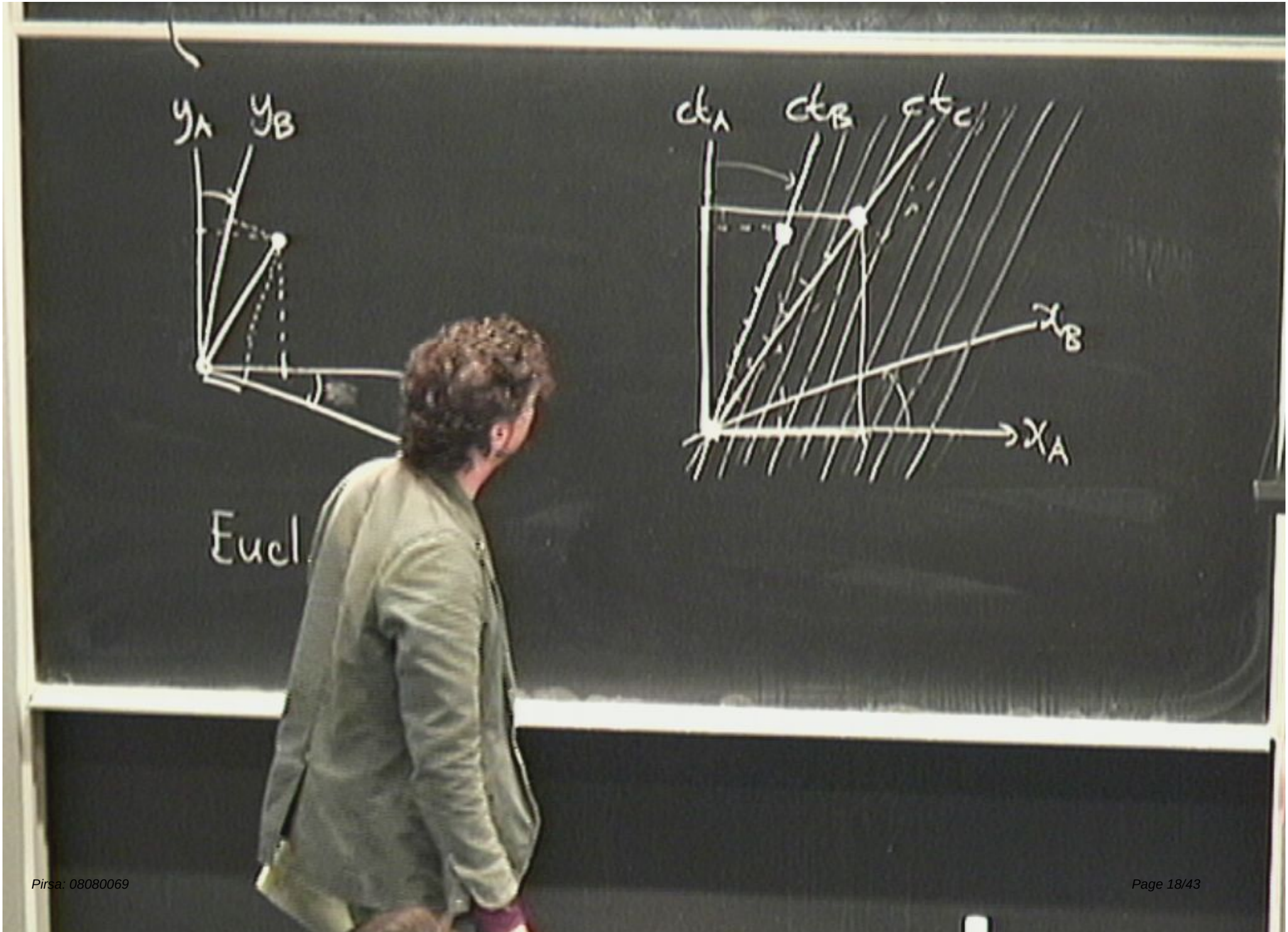
x_A
x_B
ct_A ct_B ct_{C_1}
x_B
x_A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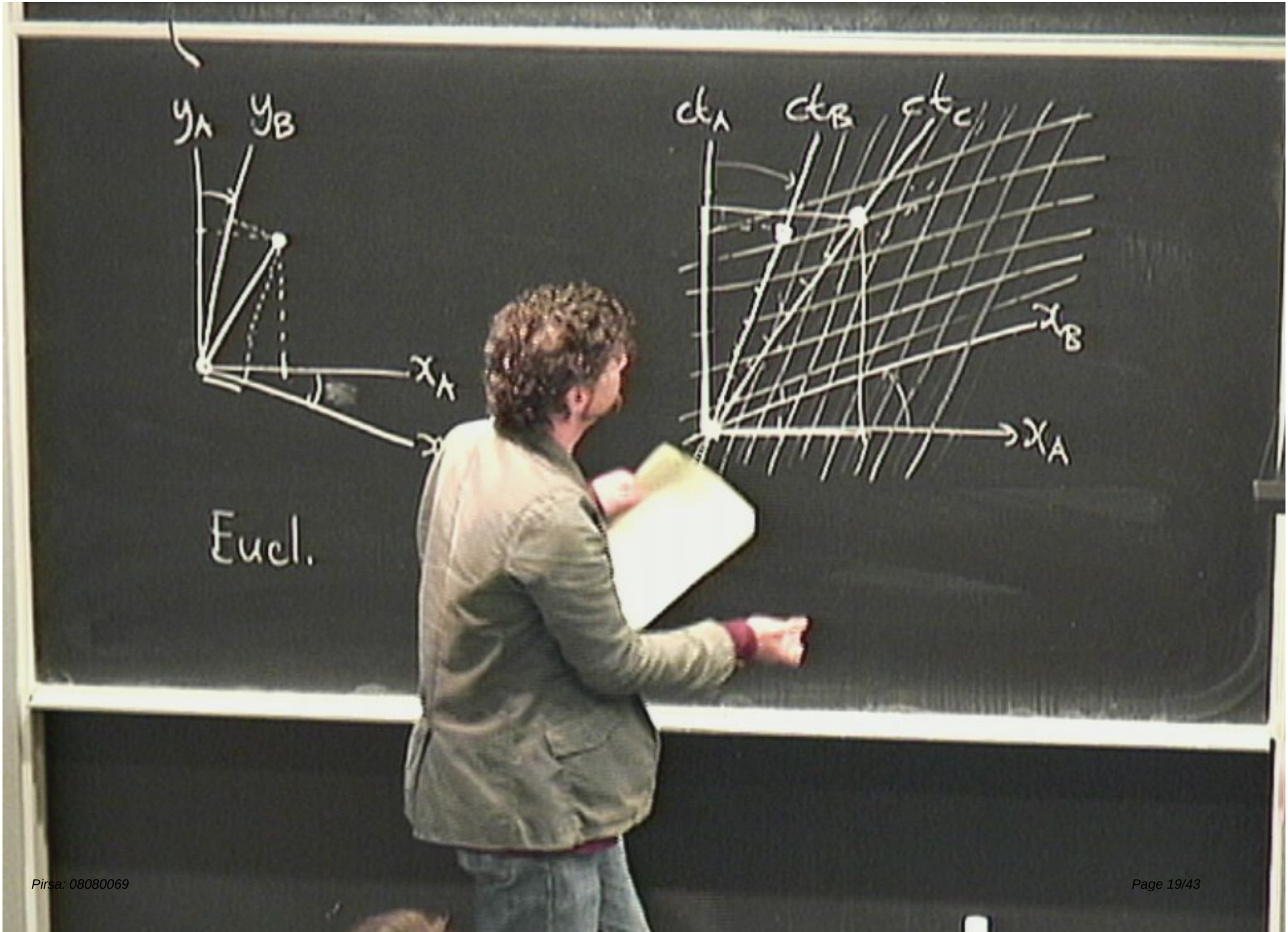
ct_A ct_B ct_C
x_B
x_A
Eucl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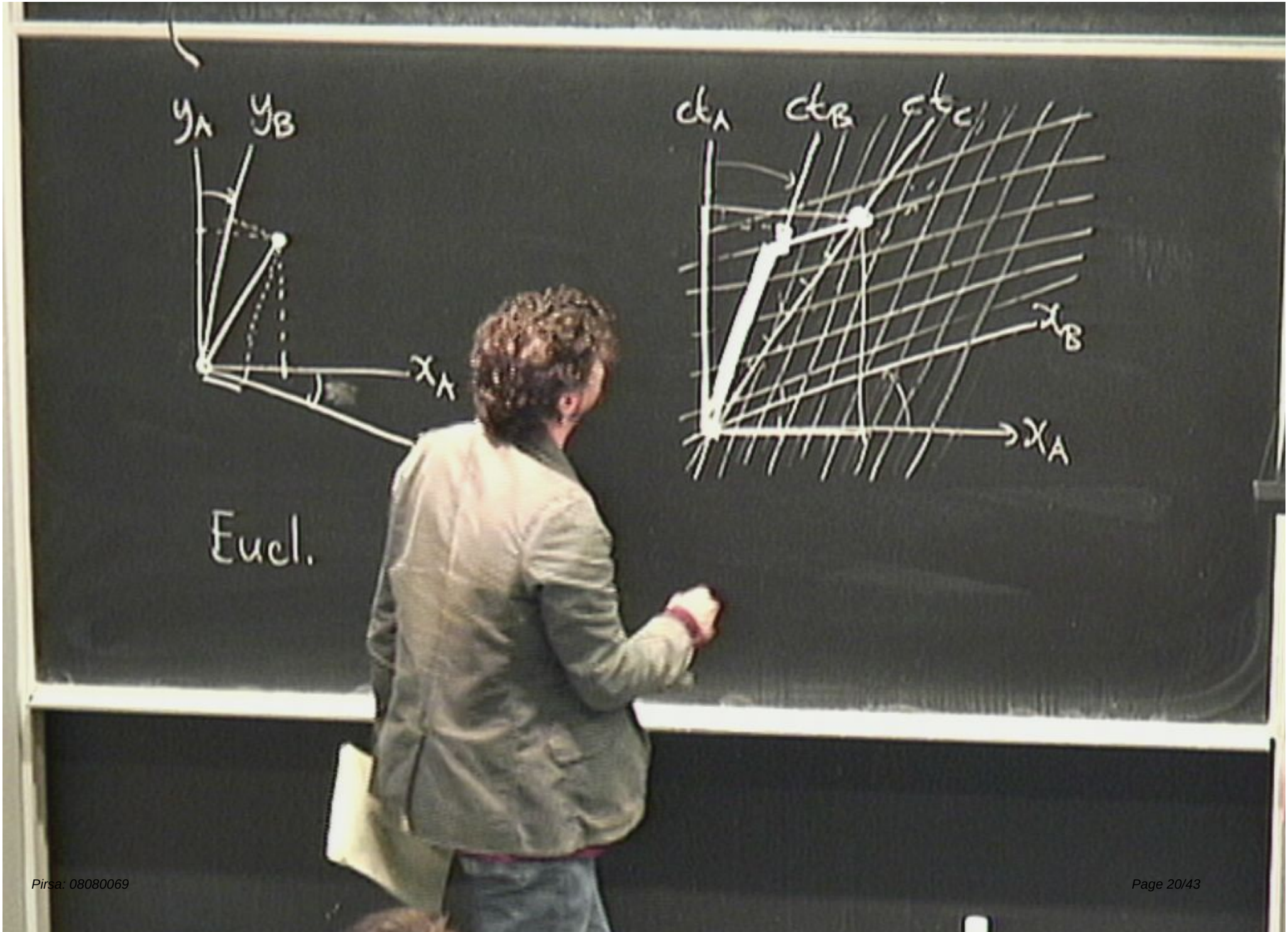
x_A
Eucl.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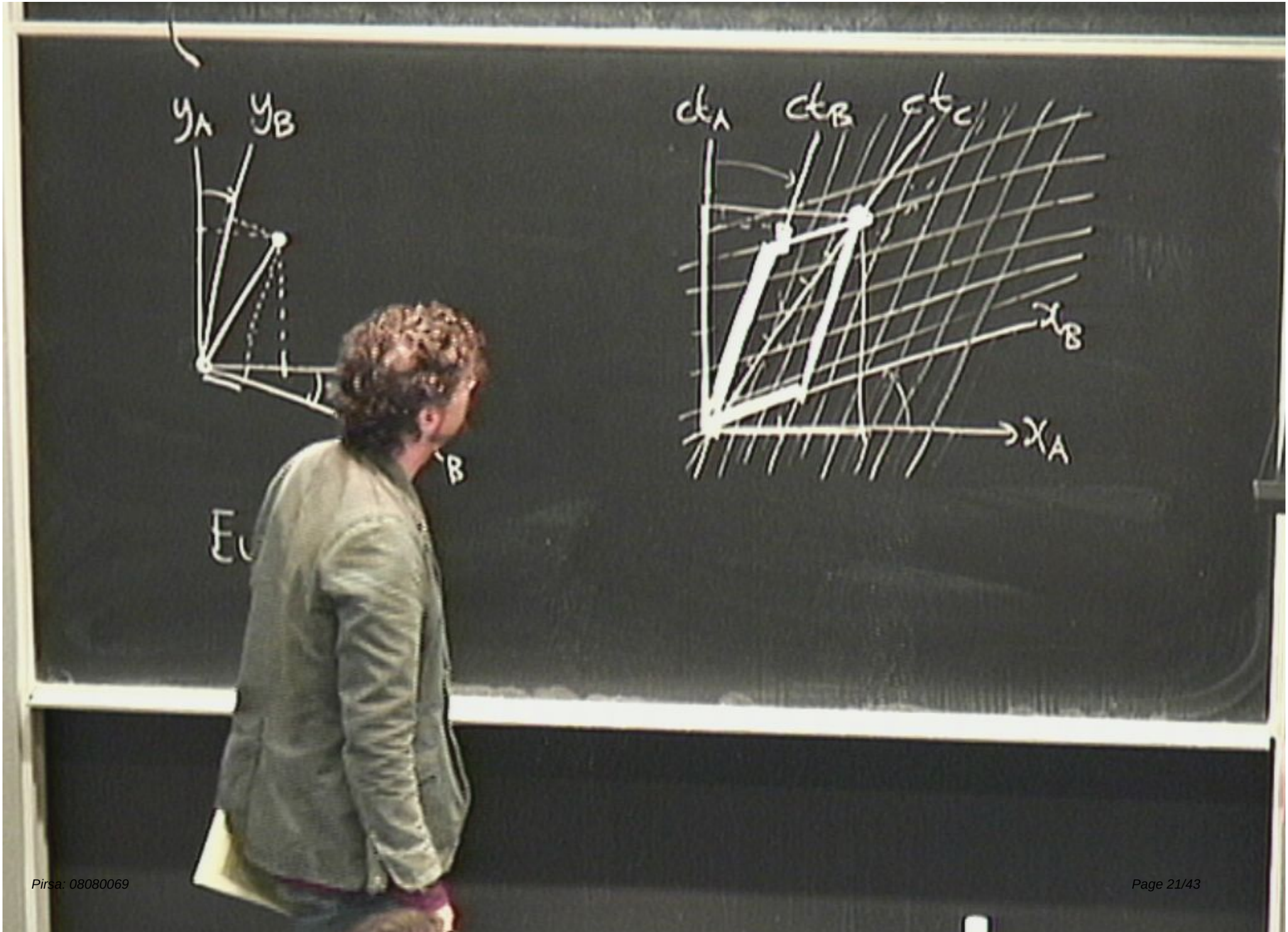
x_A
Eucl.
ct_A ct_B ct_C
x_B
x_A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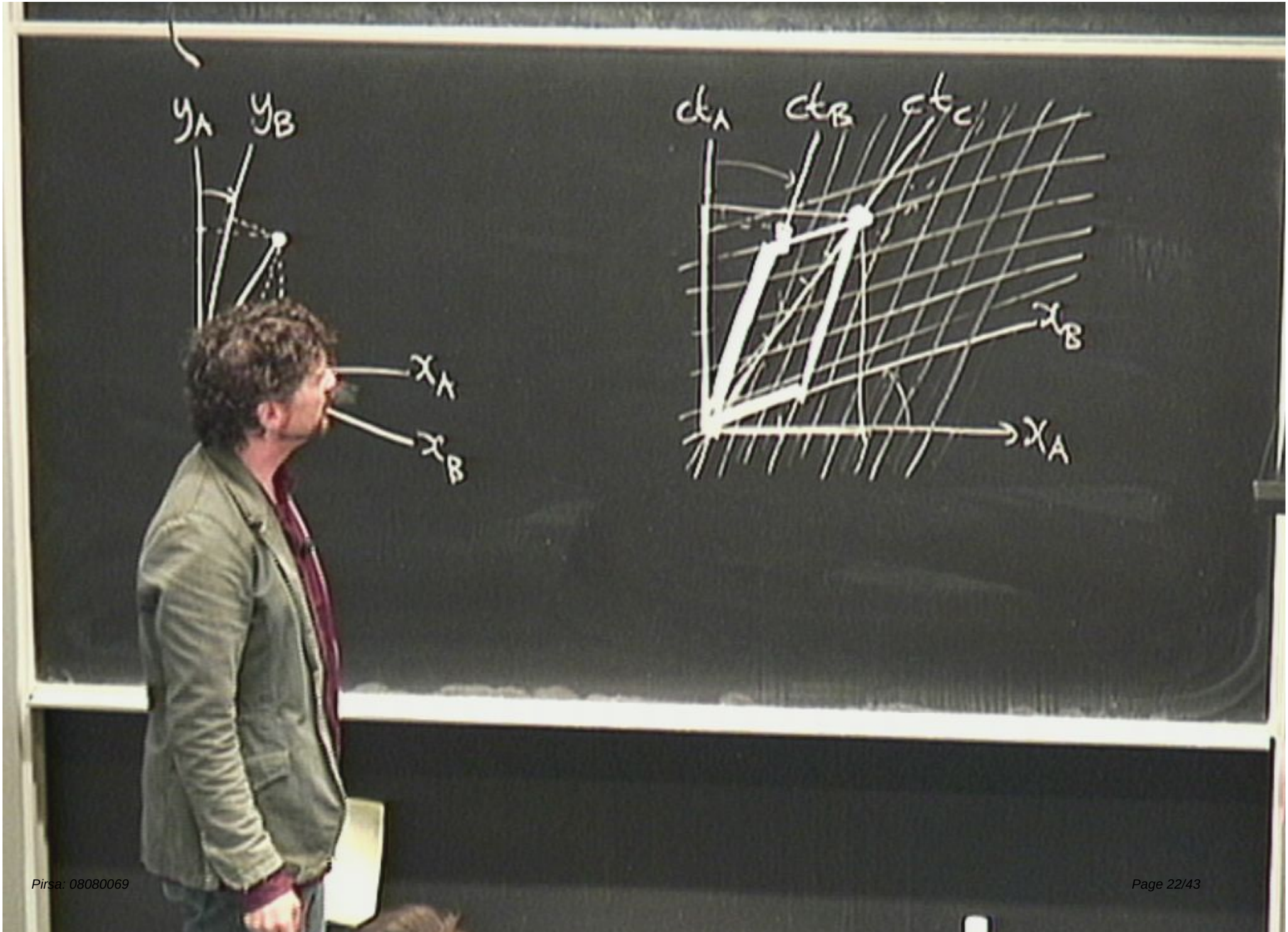
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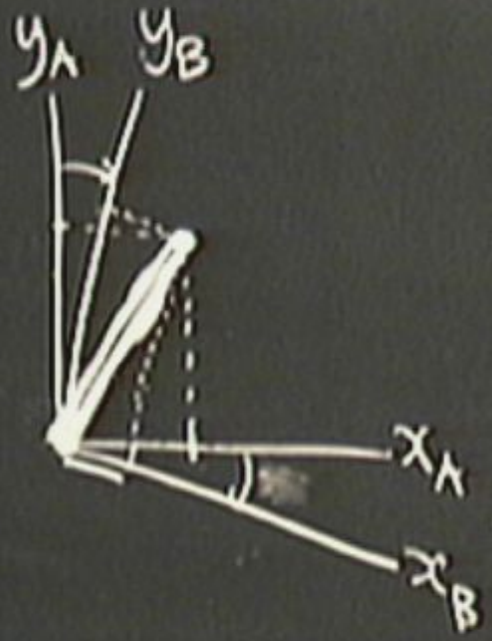
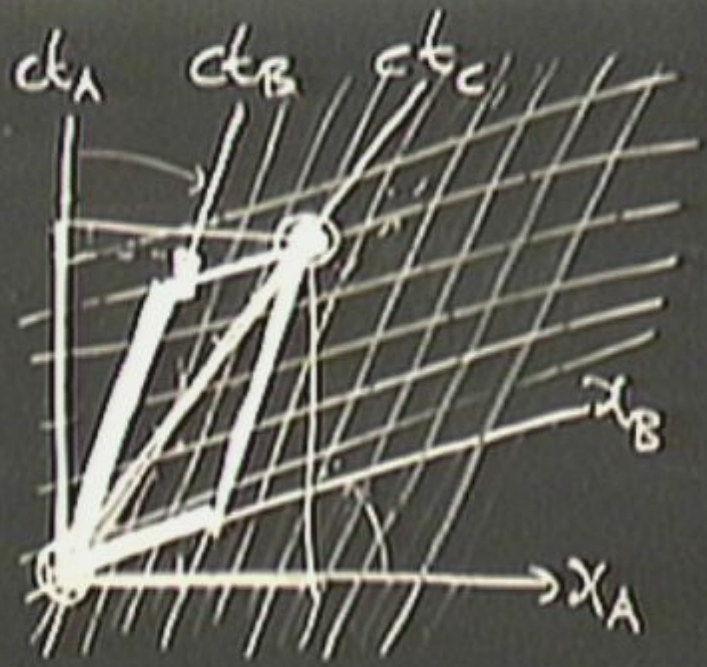
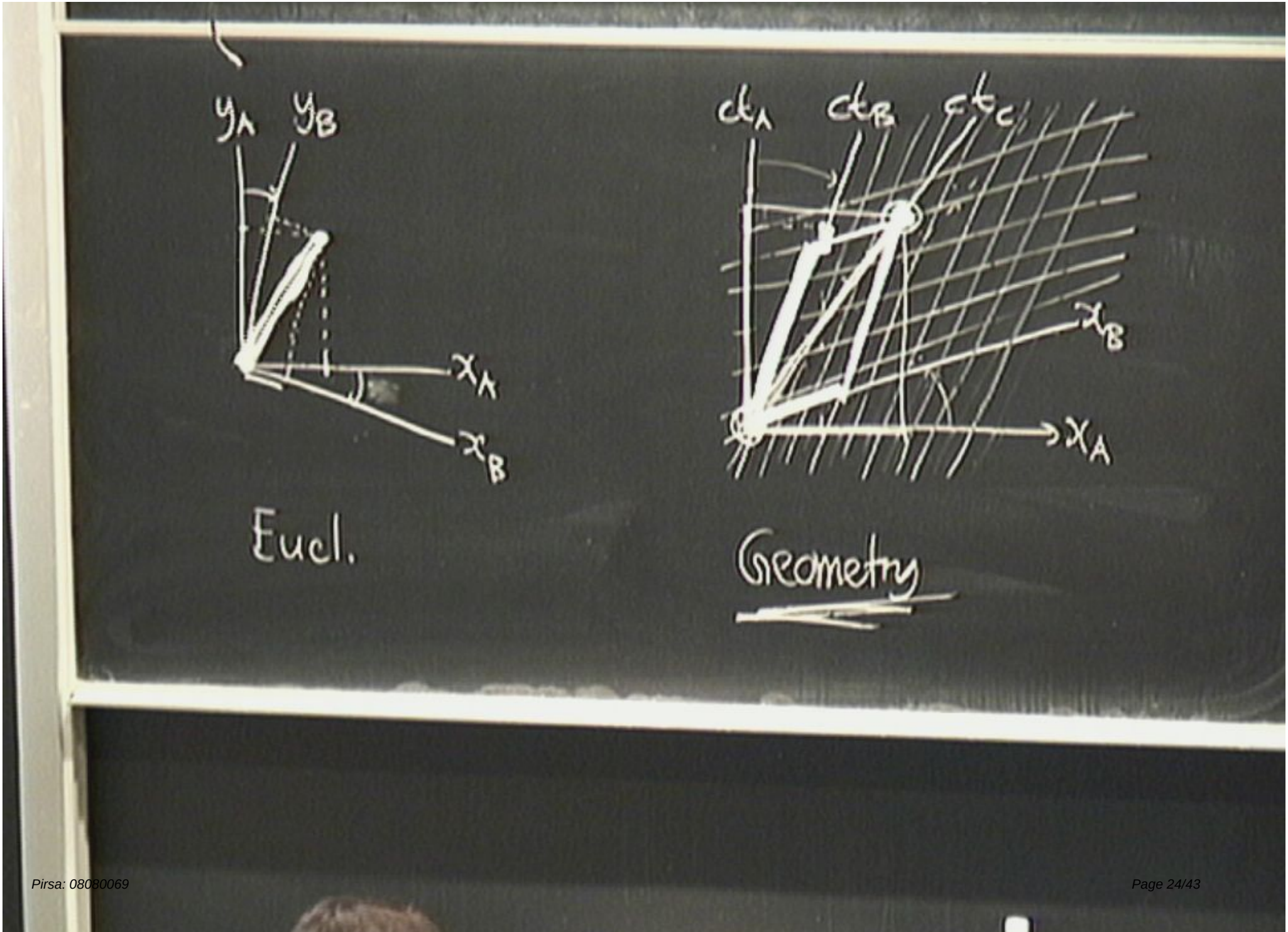
x_B
x_A

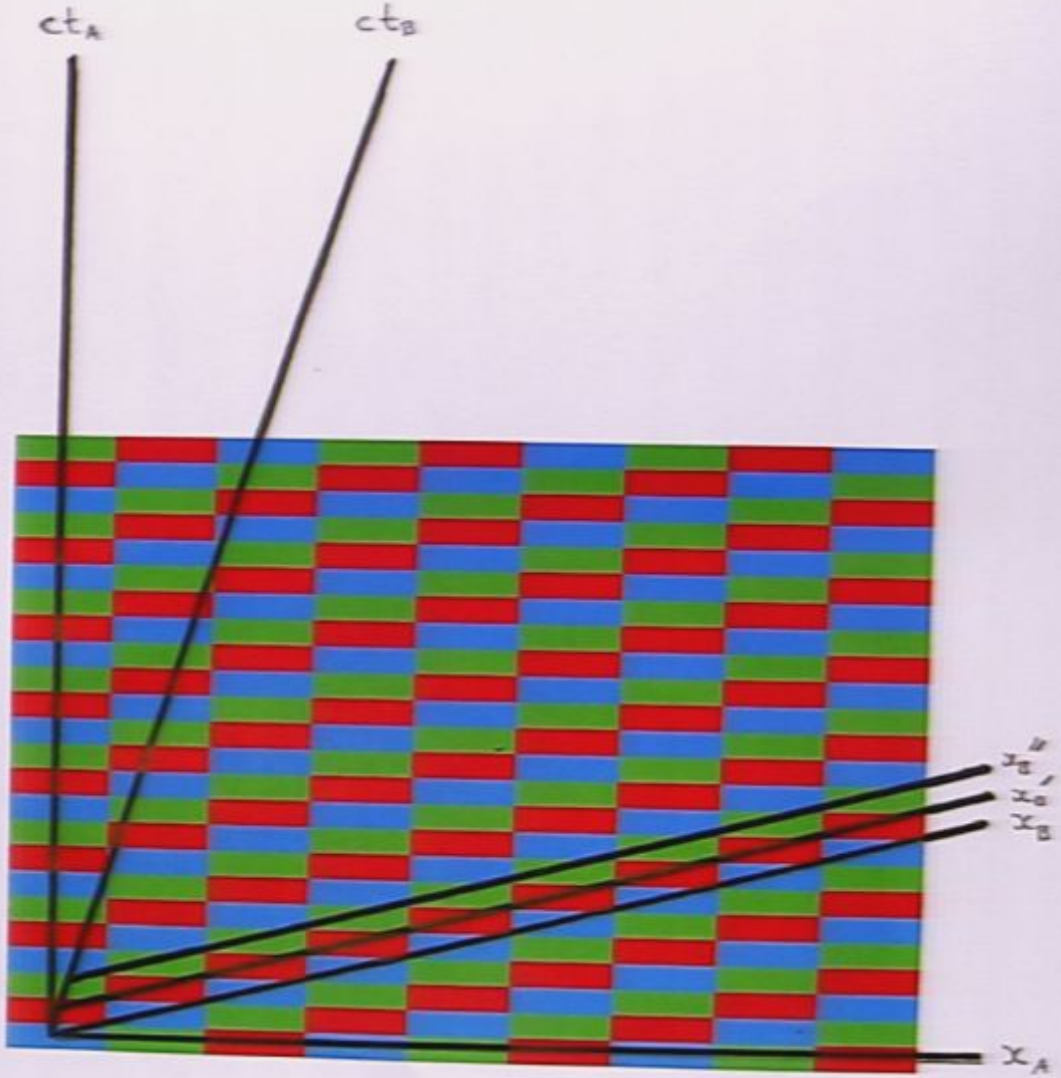


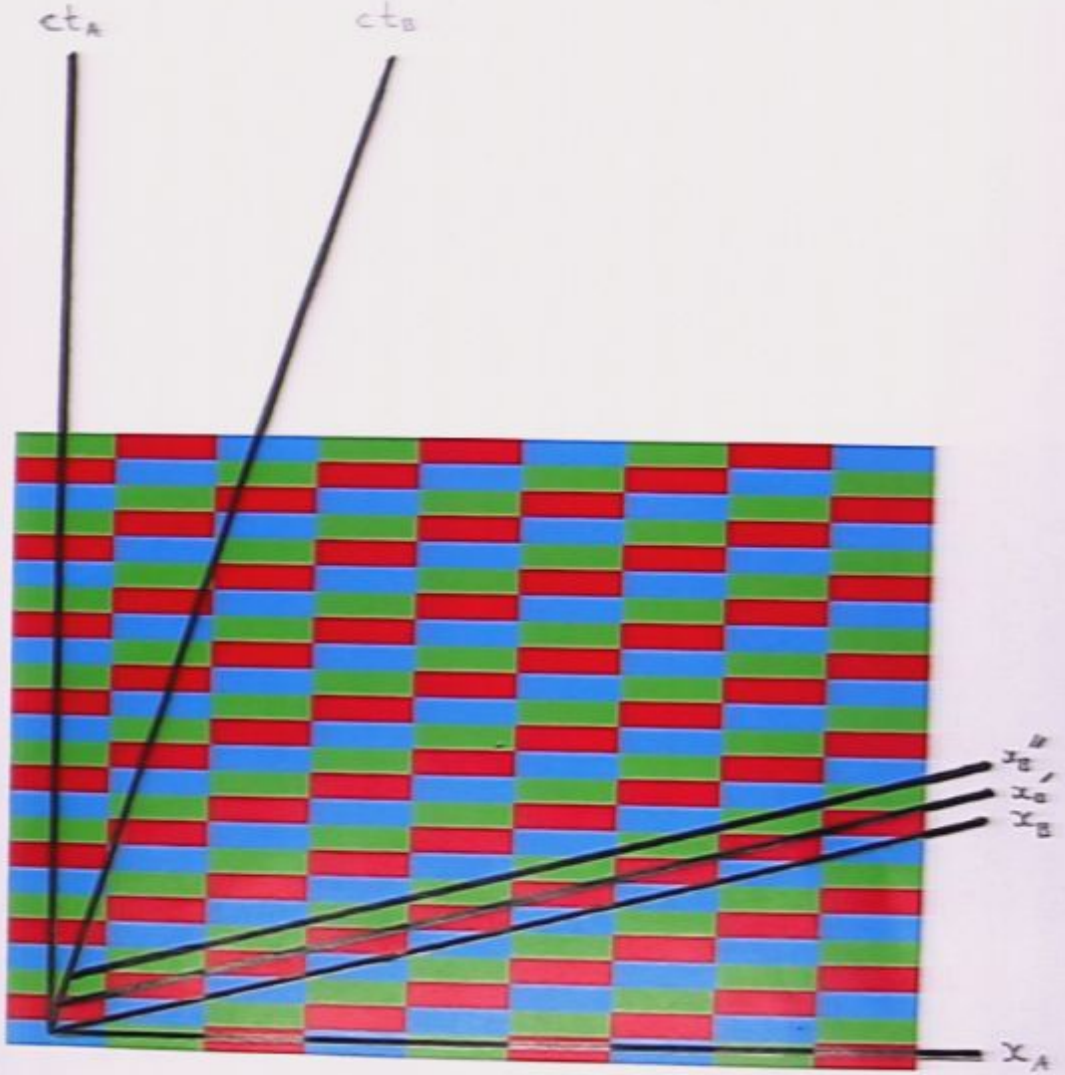


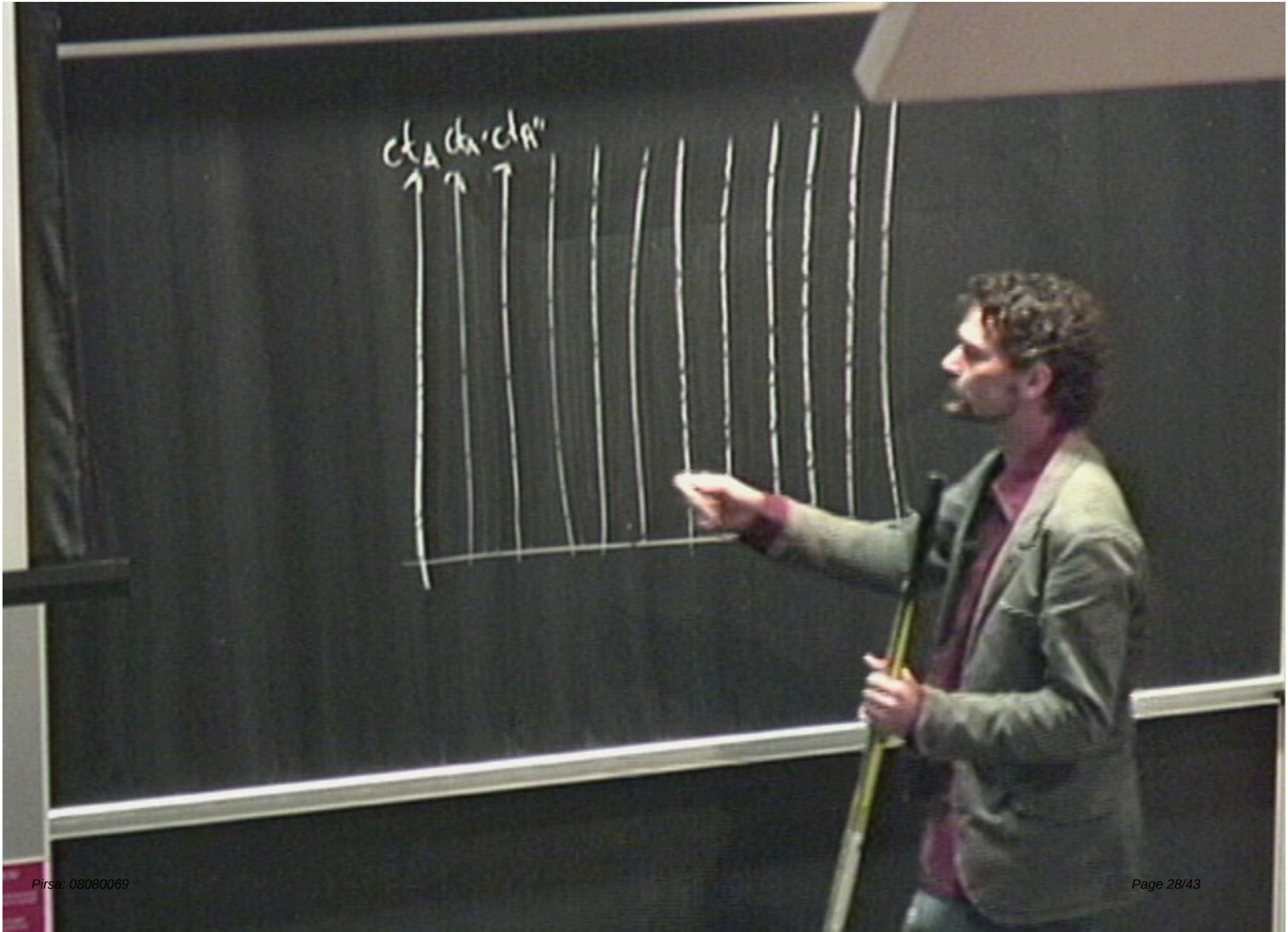
Eucl.

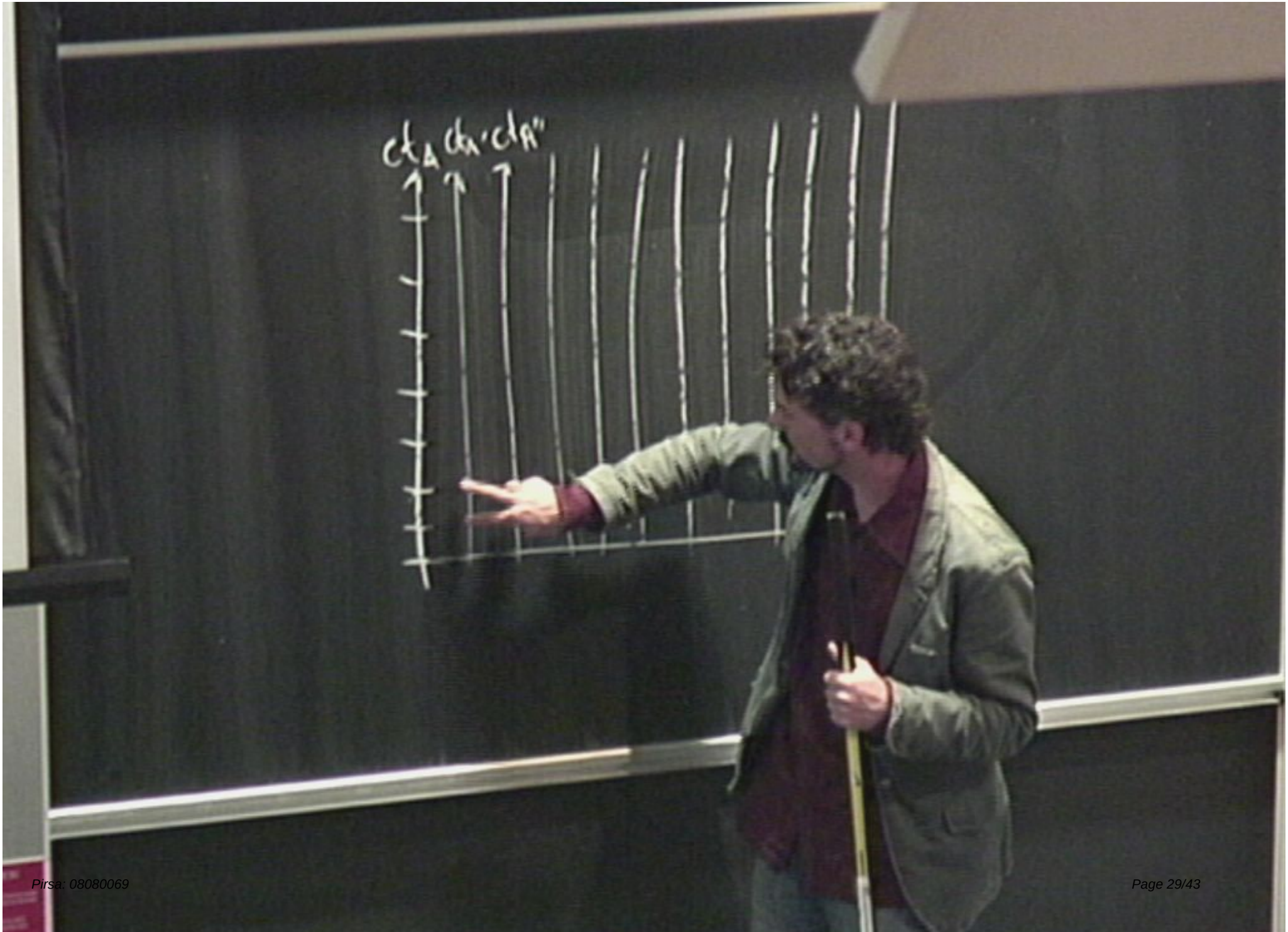

y_A y_B
x_A
x_B
Eucl.
ct_A ct_B ct_C
x_B
x_A
Geometry

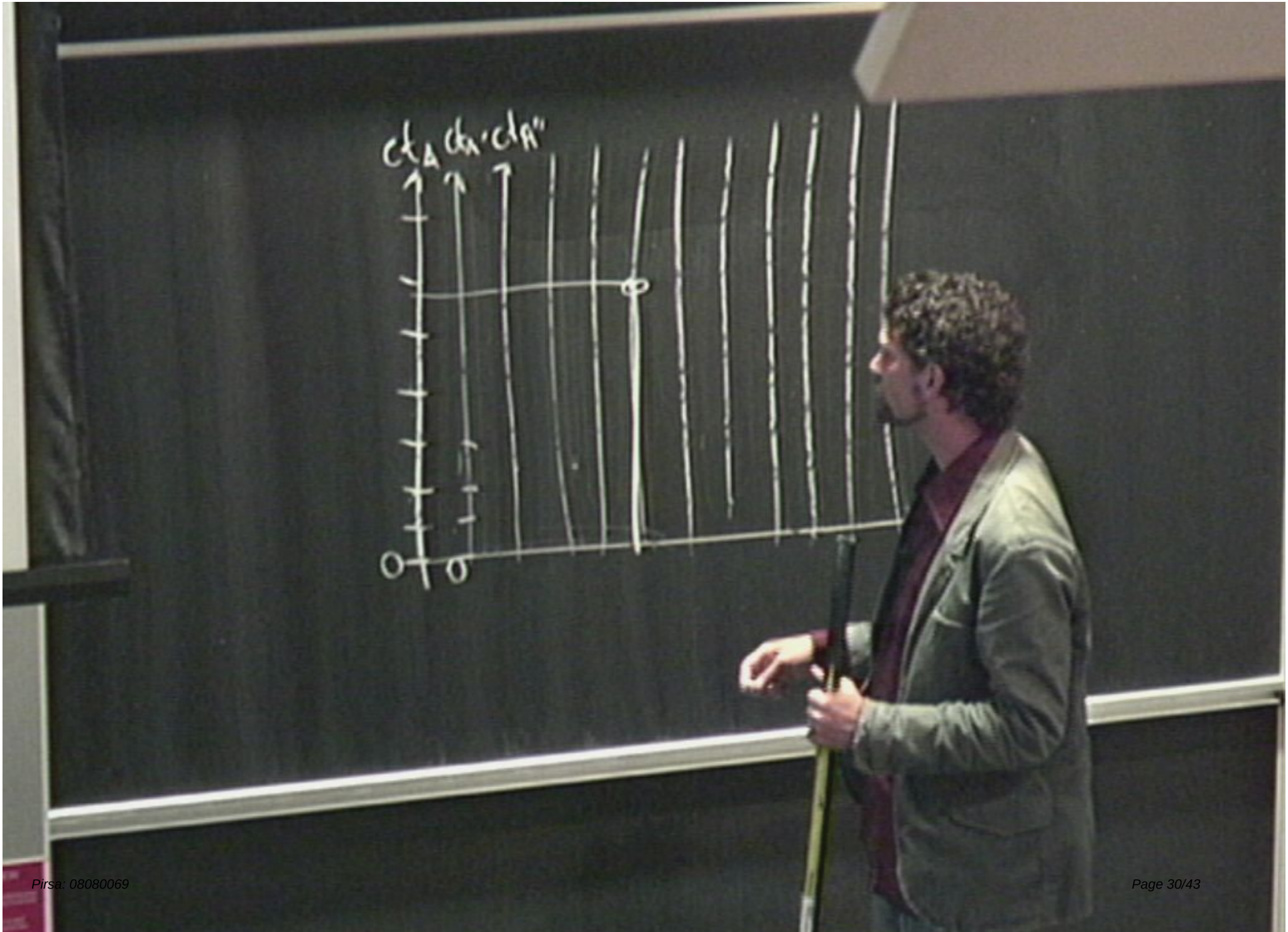
x_B''
x_B'
x_B
x_A
ct_B
ct_A

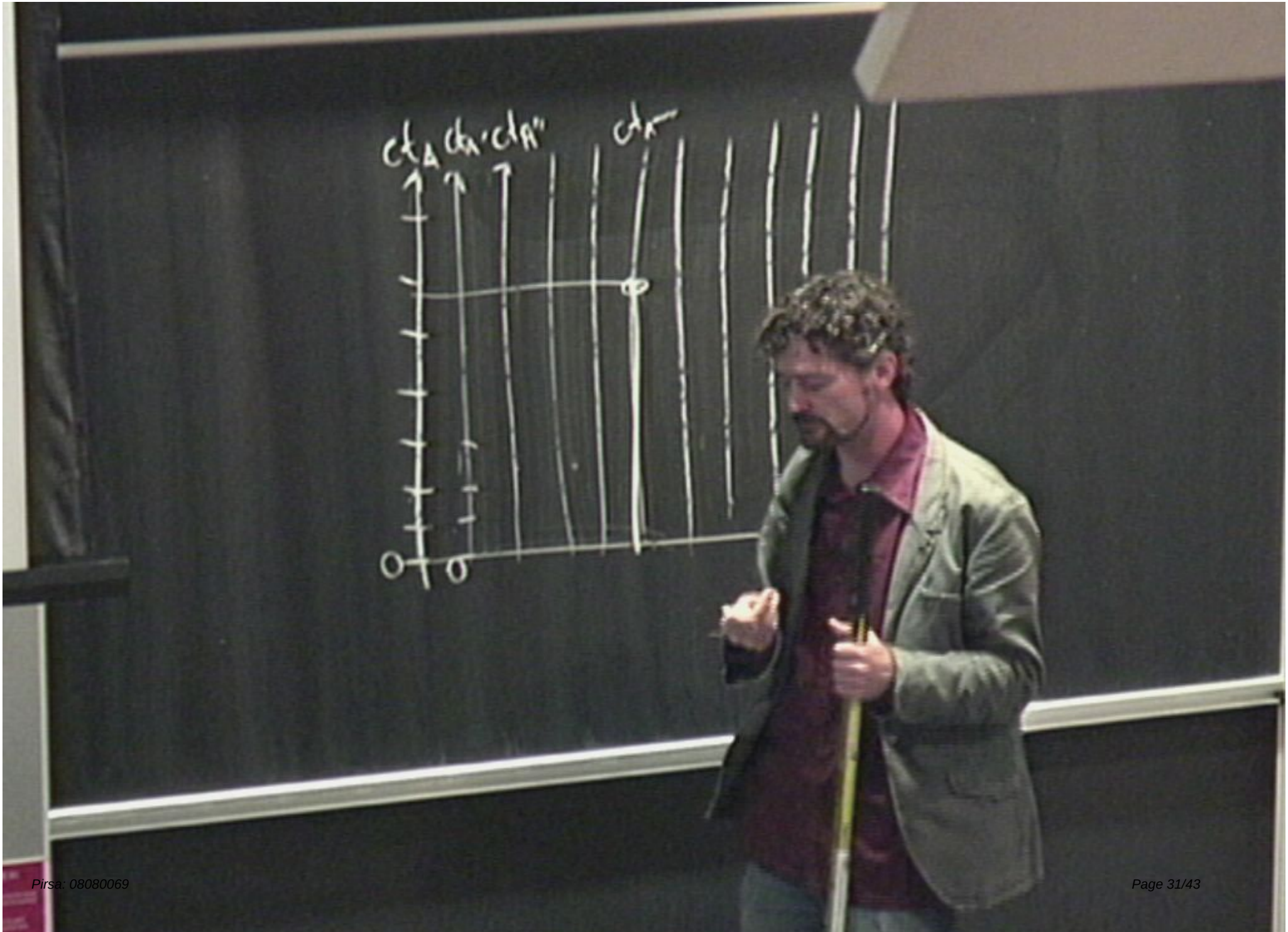

ct_A
ct_B
x_B''
x_B'
x_B
x_A

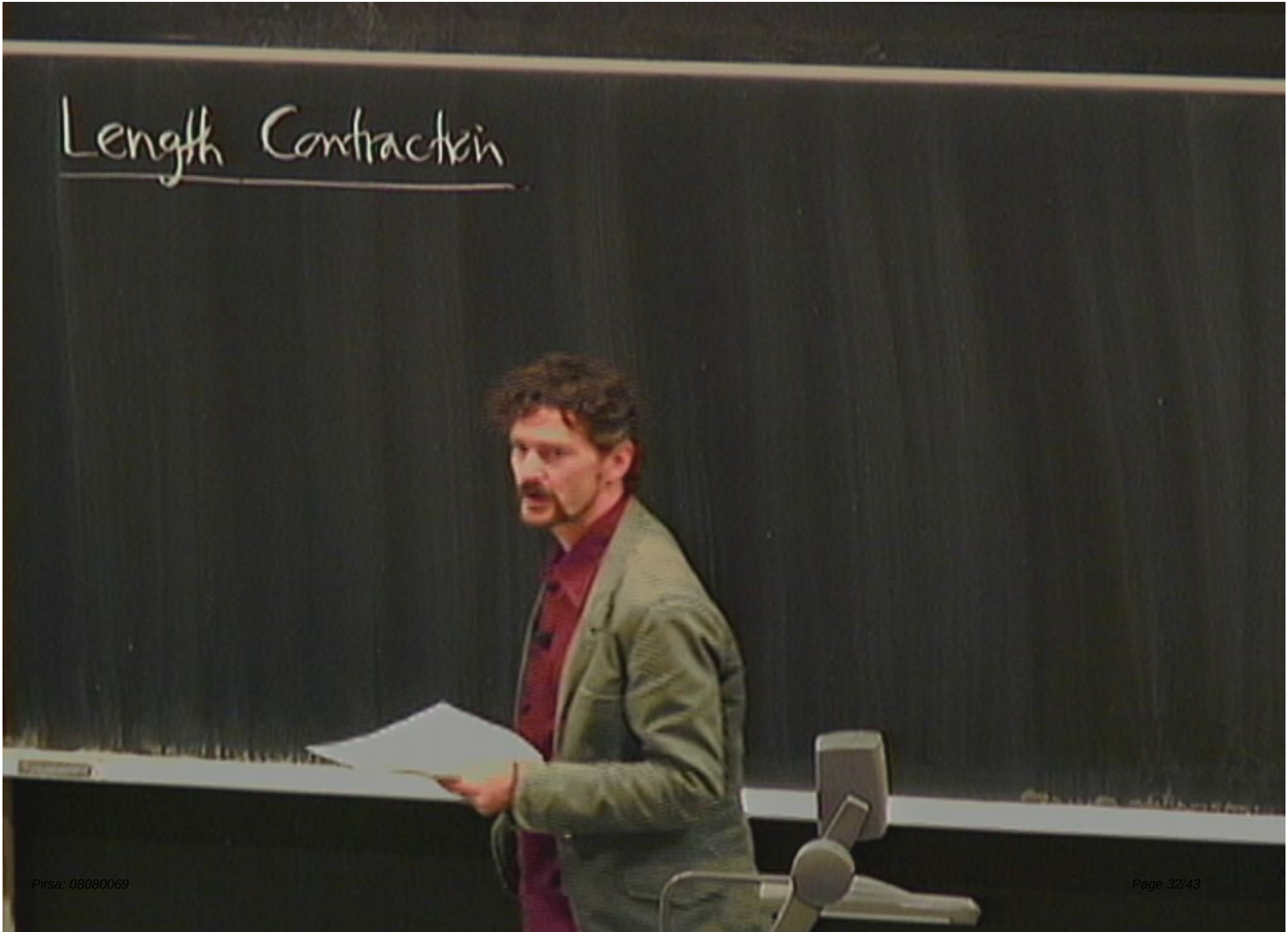

ct_A
ct_B
x_B''
x_B'
x_B
x_A

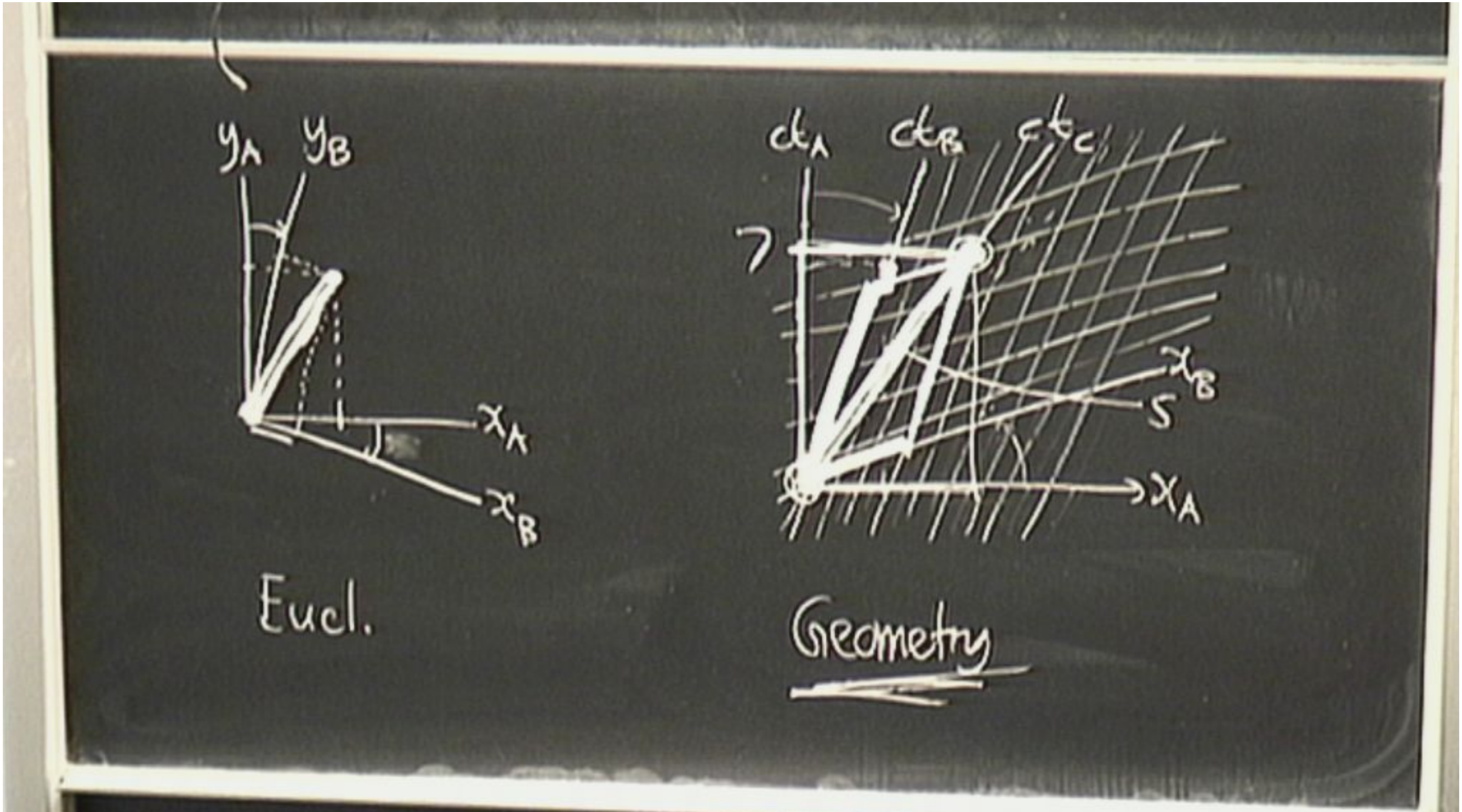

ct_A $ct_{A'}$ $ct_{A''}$


ct_A ct_A' ct_A''

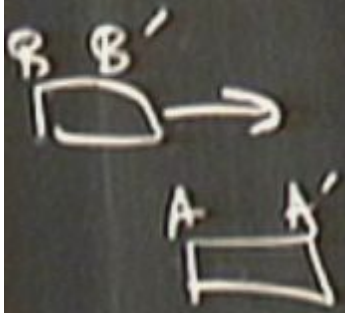

ct_A ct_A' ct_A''
0
0


ct_A $ct_{A'}$ $ct_{A''}$ $ct_{A'''}$

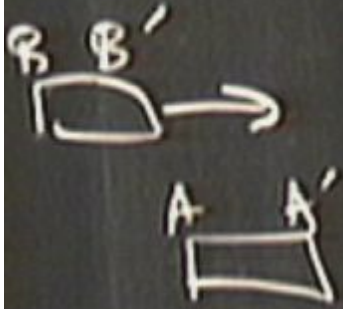

Length Contraction

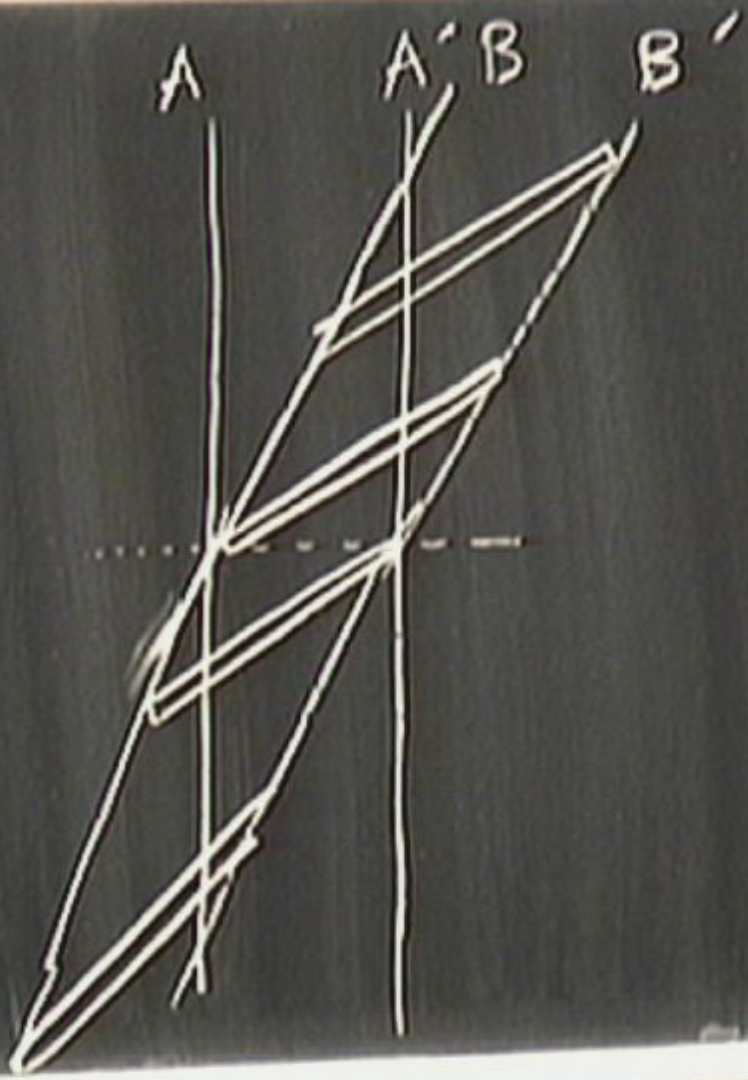

y_A y_B
x_A
x_B
Eucl.
ct_A ct_B ct_C
x_B
S
x_A
Geometry

Length Contraction

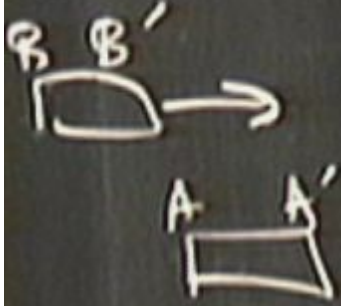


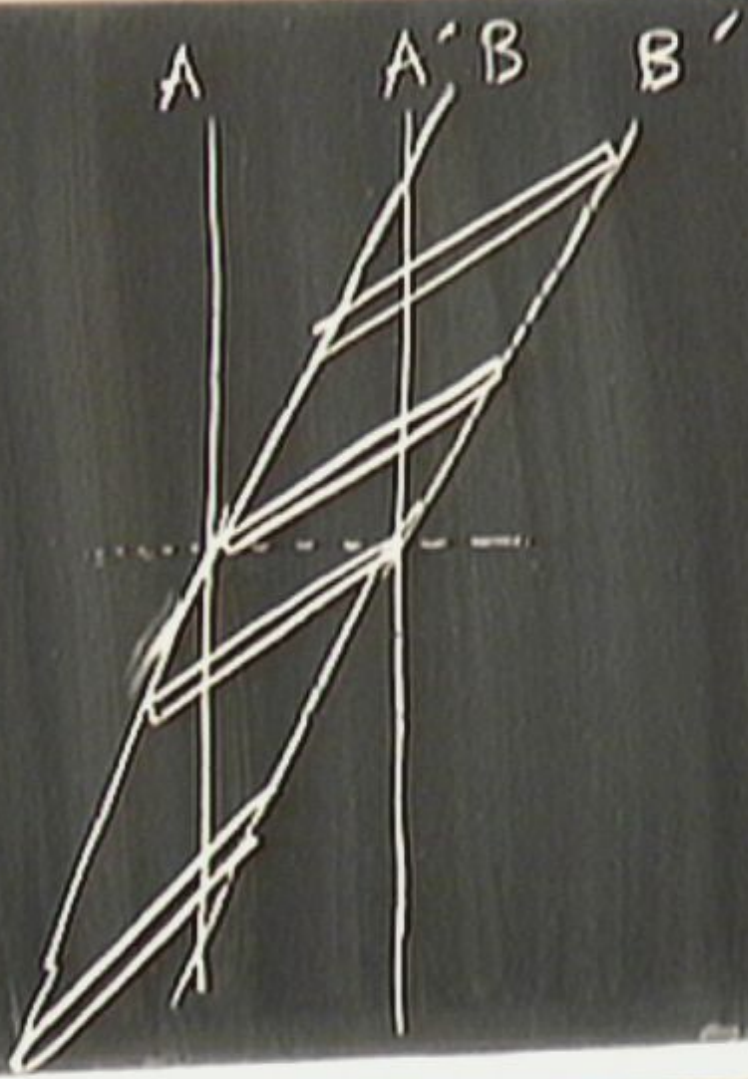
Length Contraction



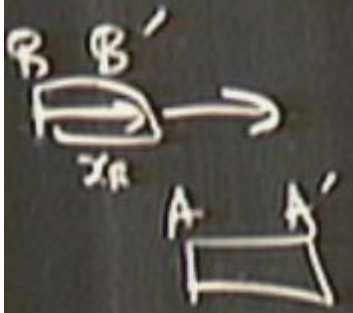


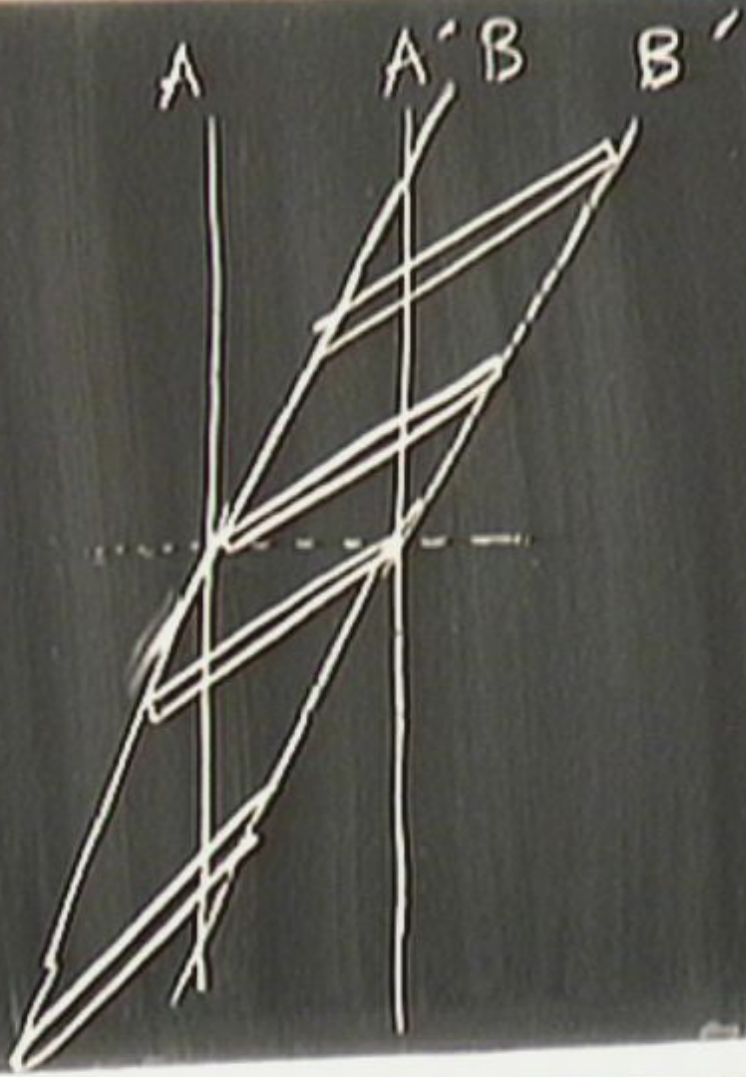
Length Contraction

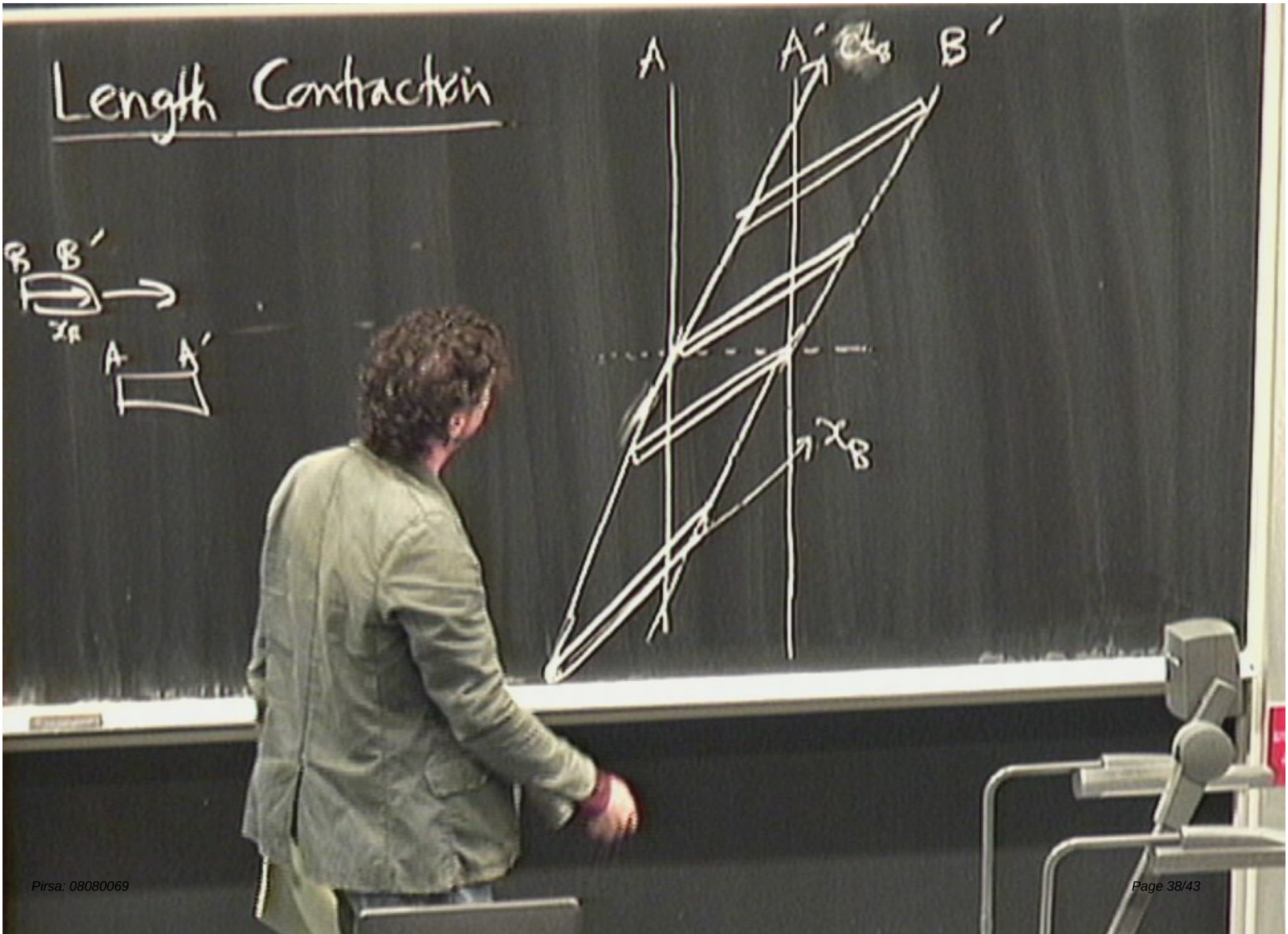


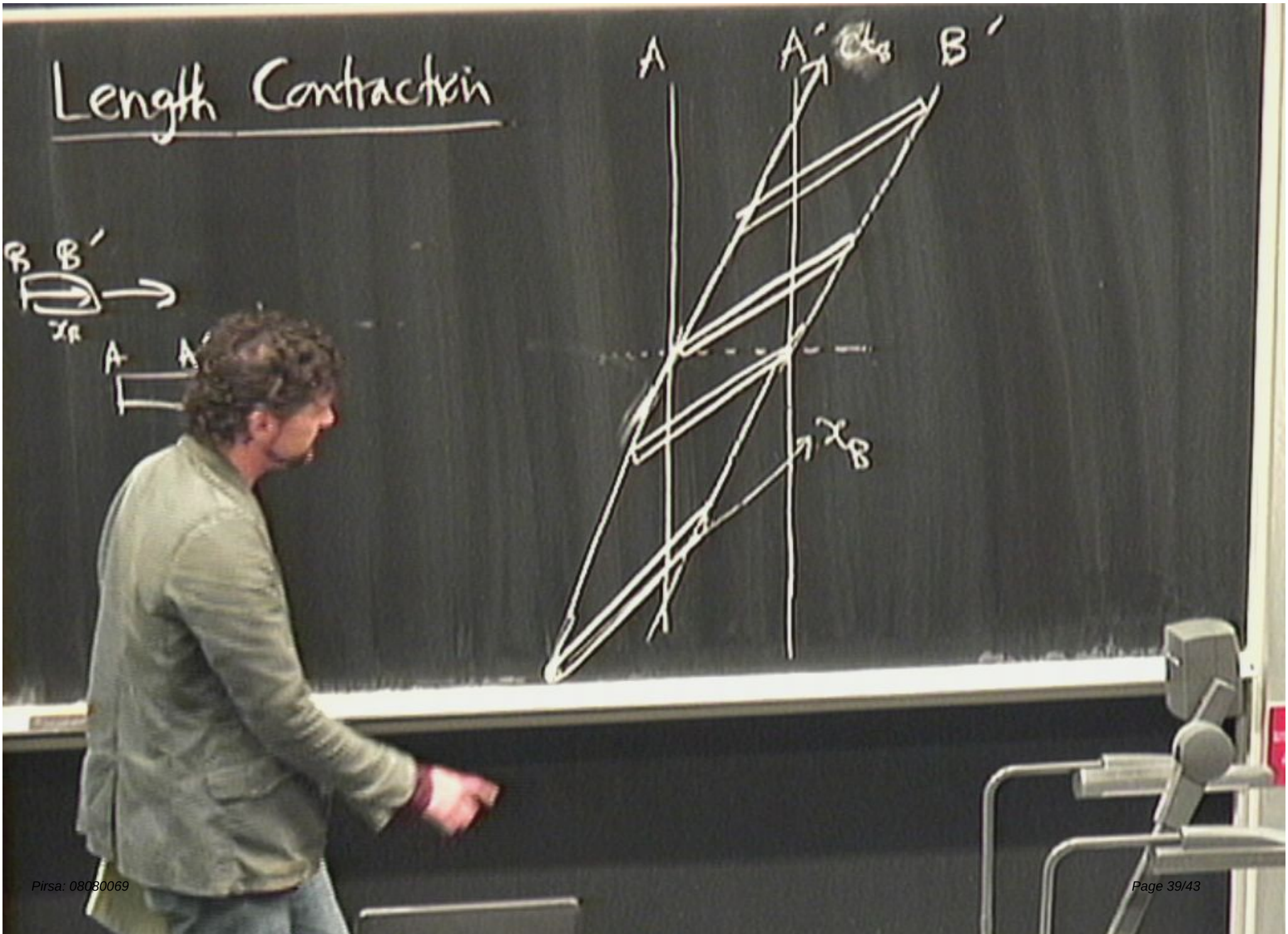


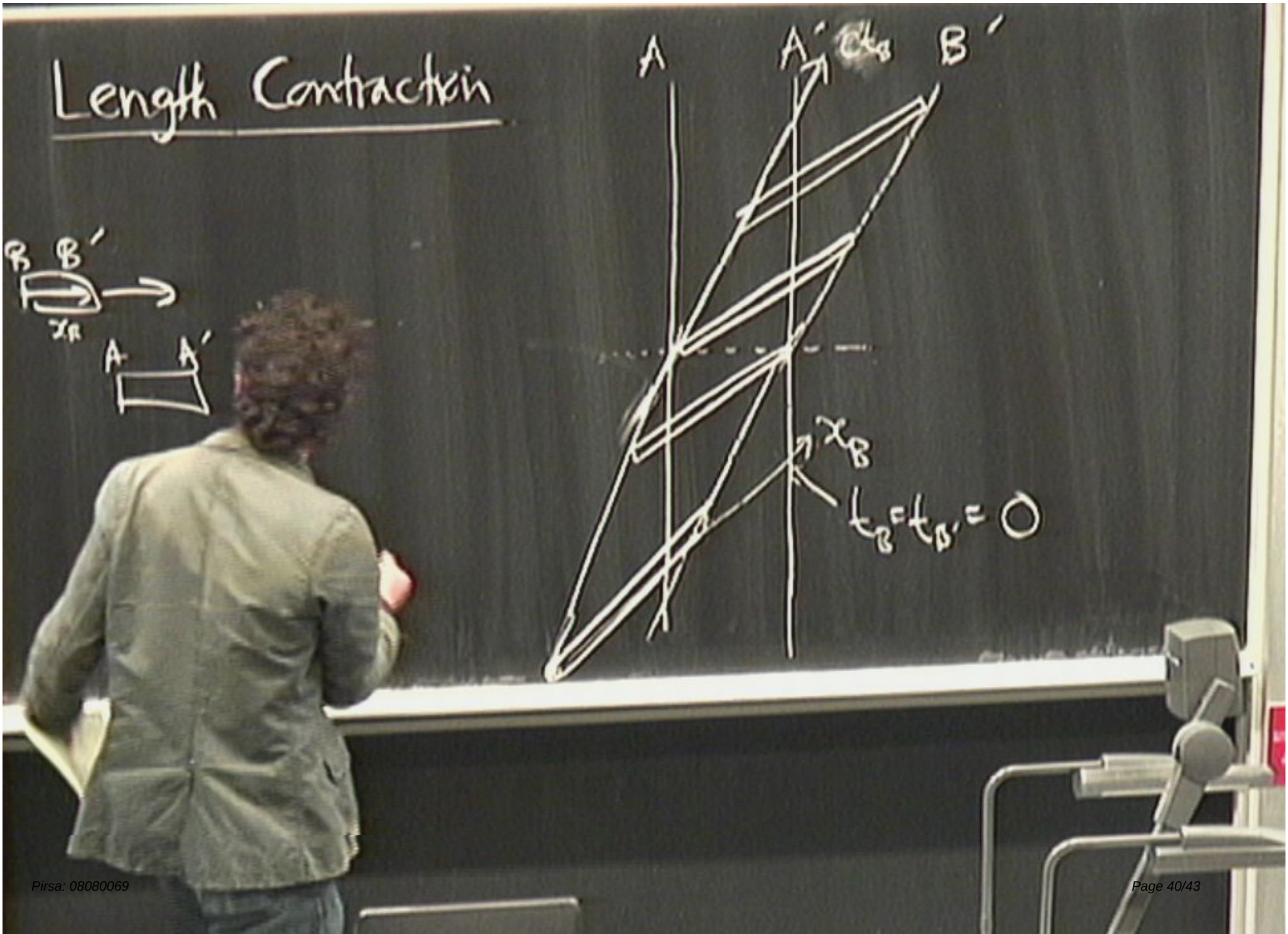
Length Contraction

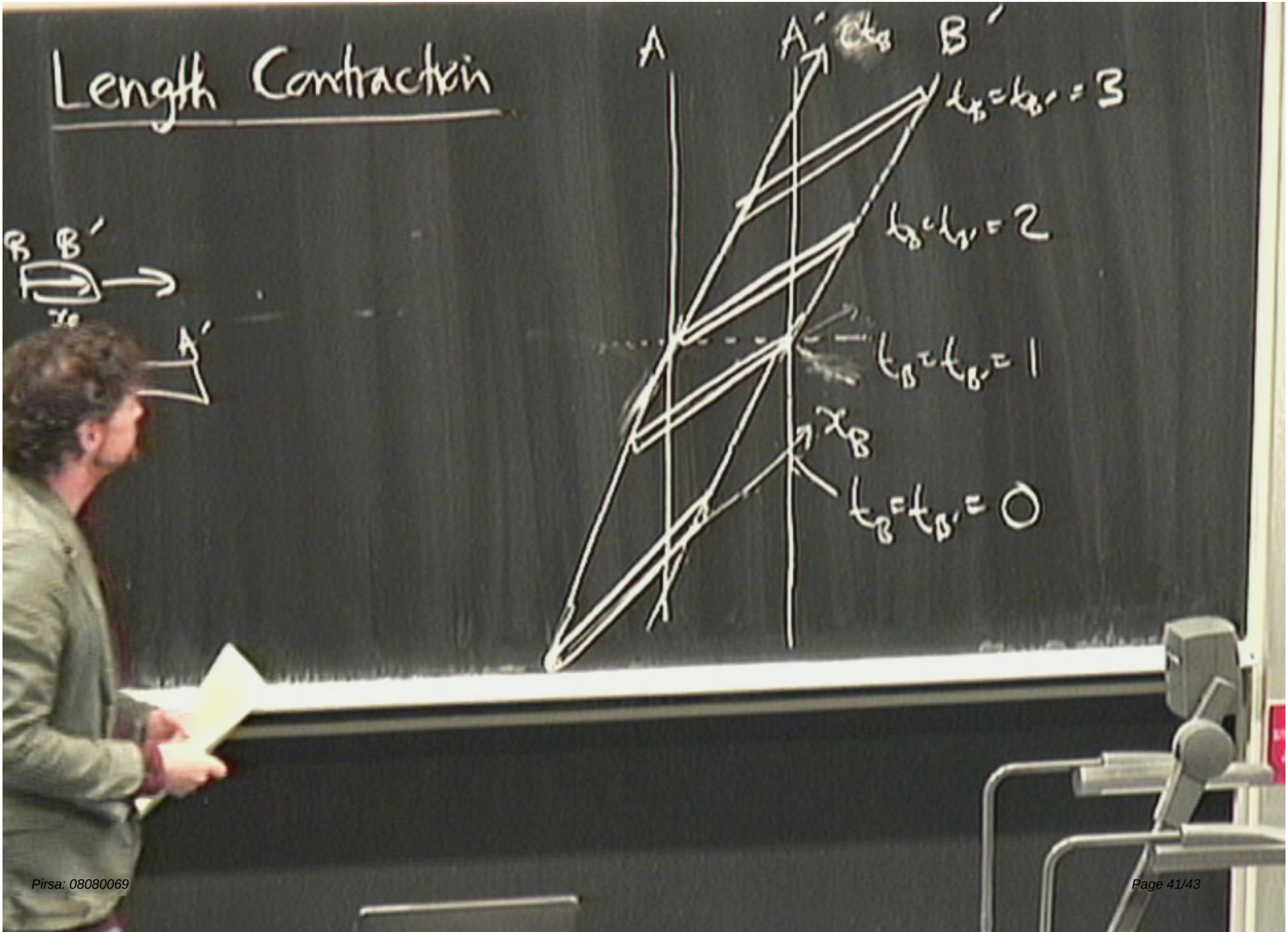




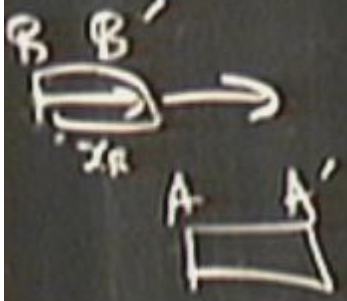

Length Contraction
A
A'
B'
B
B'
A
A'
x_B

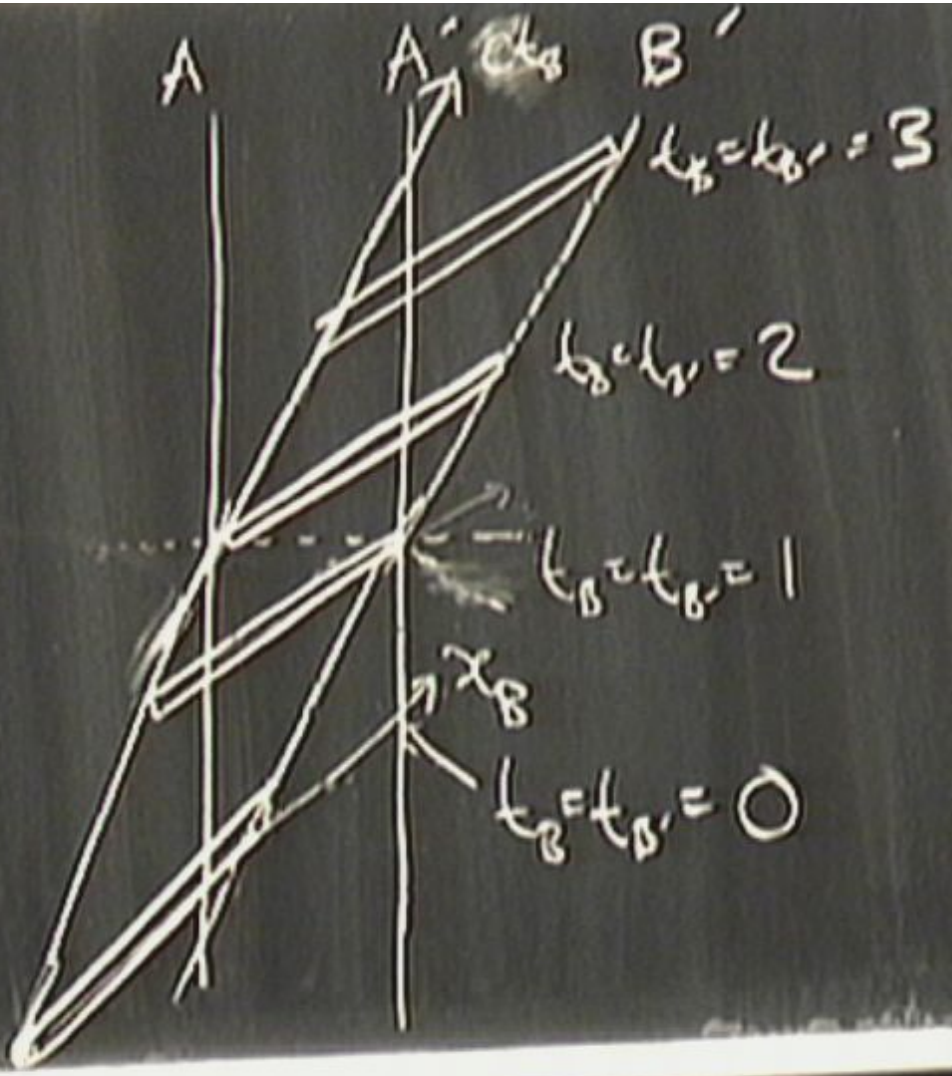

Length Contraction
A
A'
B'
B
B'
A
A'
x_B

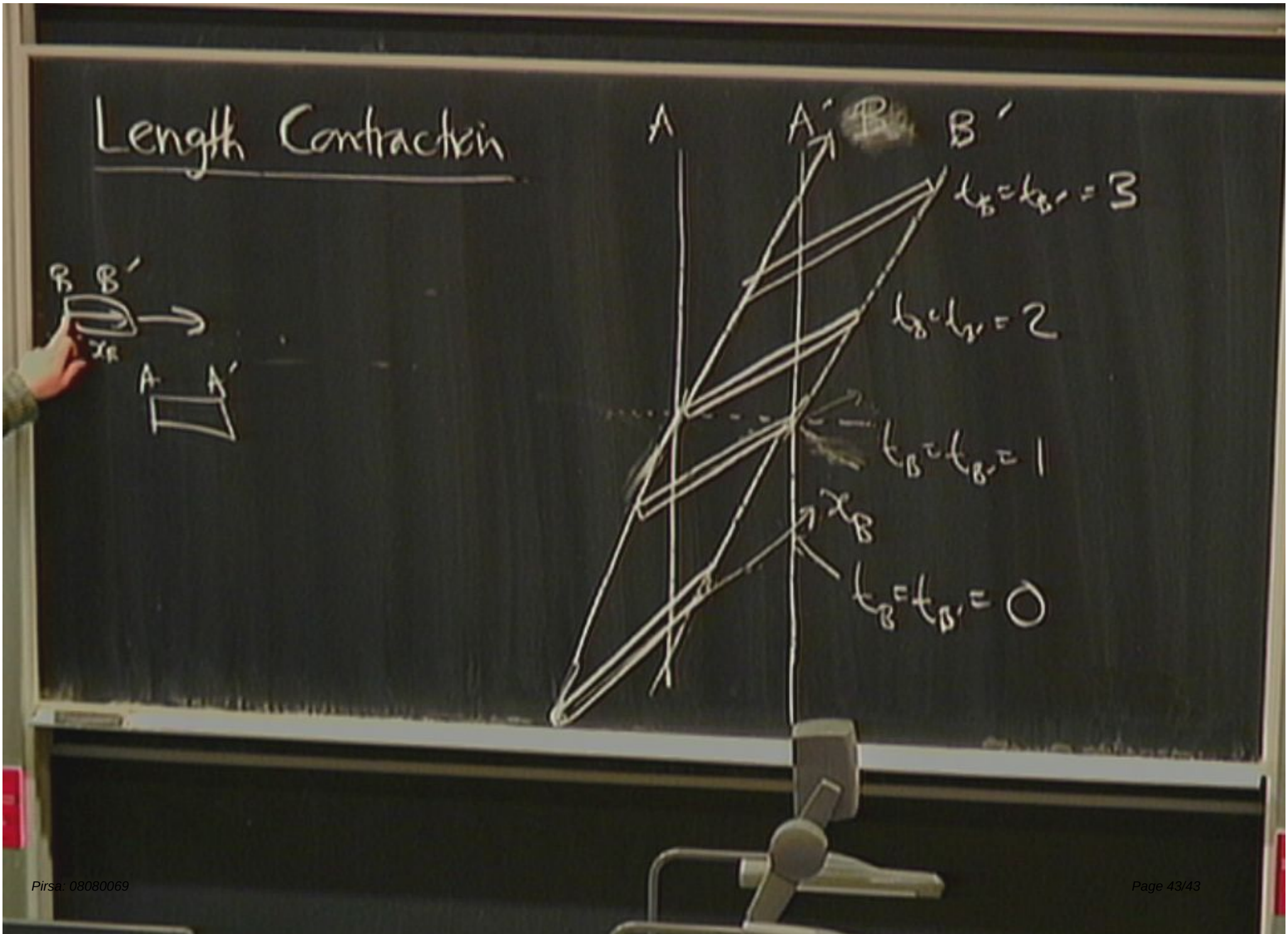

Length Contraction
A
A'
B'
B
B'
A
A'
x_B
$t_B = t_{B'} = 0$


Length Contraction
A
A'
B'
$t_B = t_{B'} = 3$
$t_B = t_{B'} = 2$
$t_B = t_{B'} = 1$
x_B
$t_B = t_{B'} = 0$
B
B'
A'

Length Contraction






Length Contraction
A
A'
B
B'
$t_B = t_{B'} = 3$
$t_B = t_{B'} = 2$
$t_B = t_{B'} = 1$
x_B
$t_B = t_{B'} = 0$
B B'
x_B
A A'