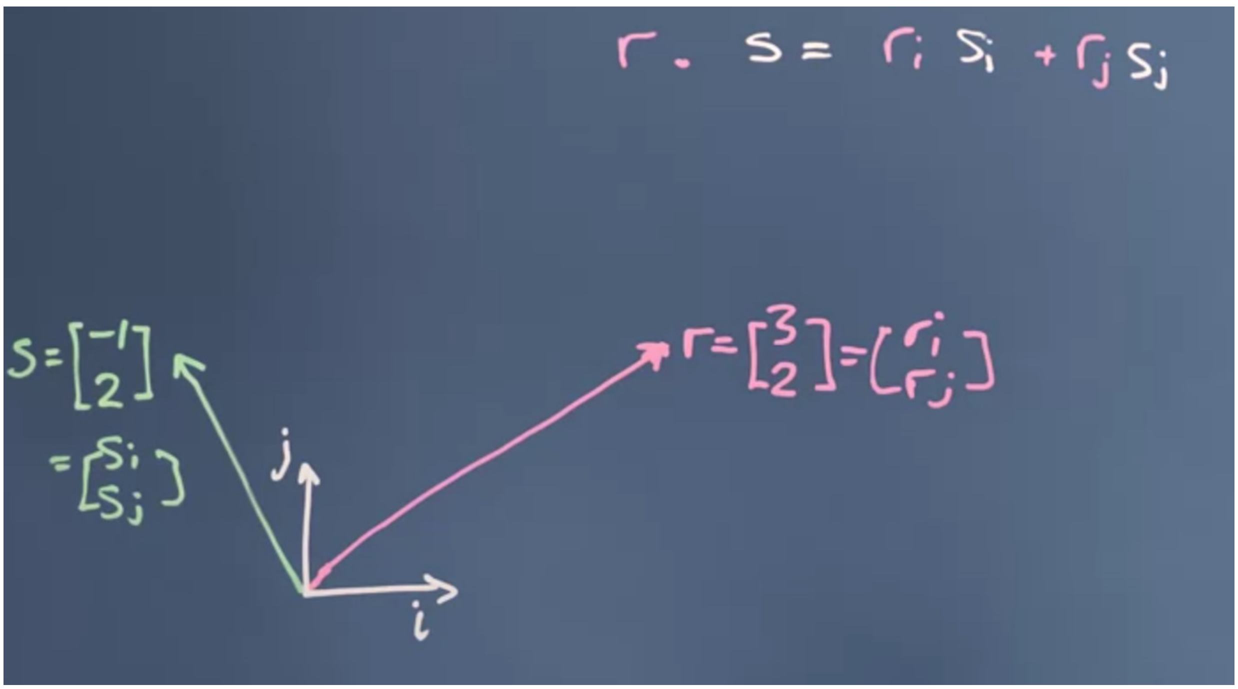
Week2

Tuesday, October 20, 2020 8:41 PM

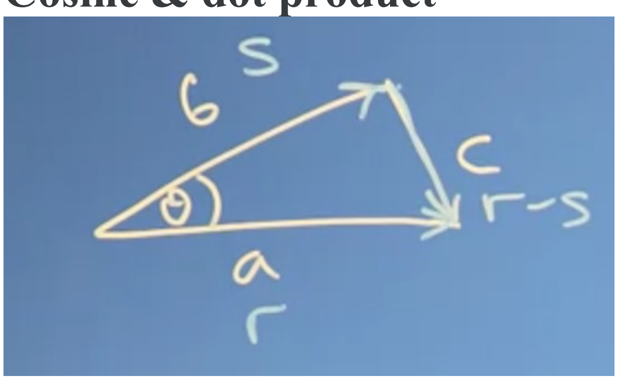
Modulus & inner product

Length of vector (also called size)
r * r = $|r|^2$

The dot product of a vector, also called inner scalar or projection product (just a number)
r * s = s * r (commutative)
r * (s + t) = r*s + r*t (distributive)
r * as = a (r * s) (associative)



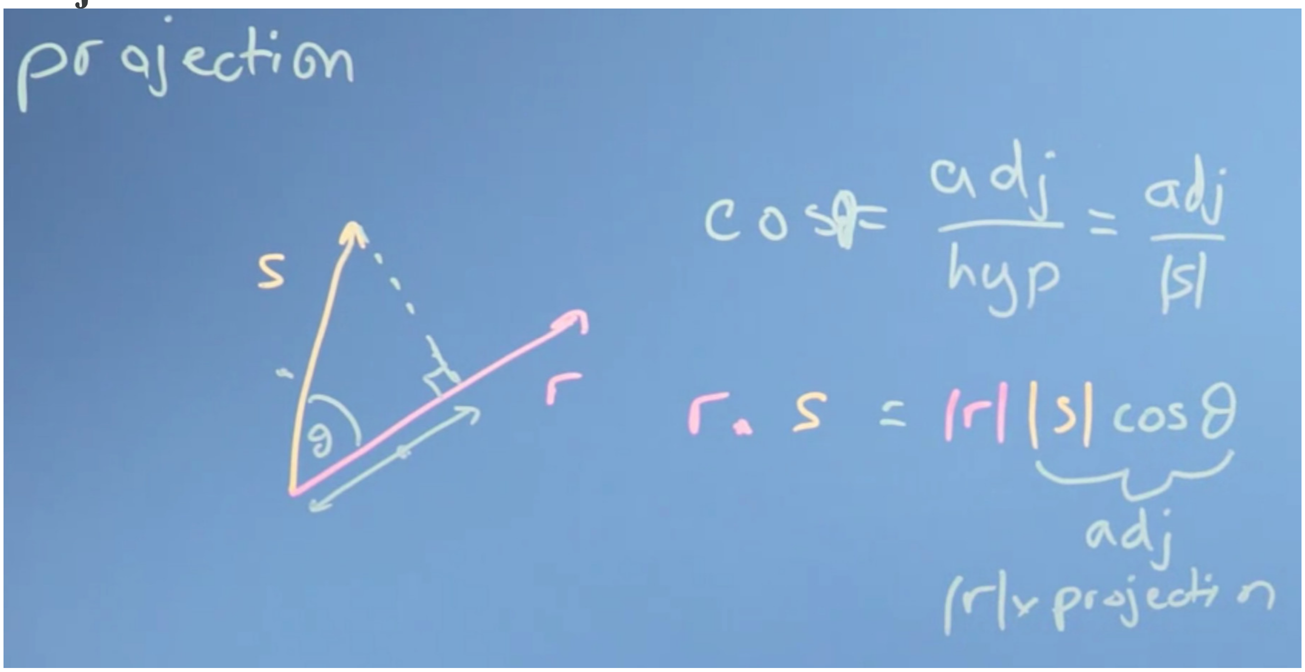
Cosine & dot product



Cosine rule

$c^2 = a^2 + b^2 - 2ab * \cos\theta$
Based on this rule, so
$|r - s|^2 = |r|^2 + |s|^2 - 2|r||s| \cos\theta$
$|r|^2 + |s|^2 - 2r * s = |r|^2 + |s|^2 - 2|r||s| \cos\theta$
So, $r * s = |r||s| \cos\theta$
$\mathrm{Cos}\theta = \dfrac{r * s}{|r||s|}$

Projection



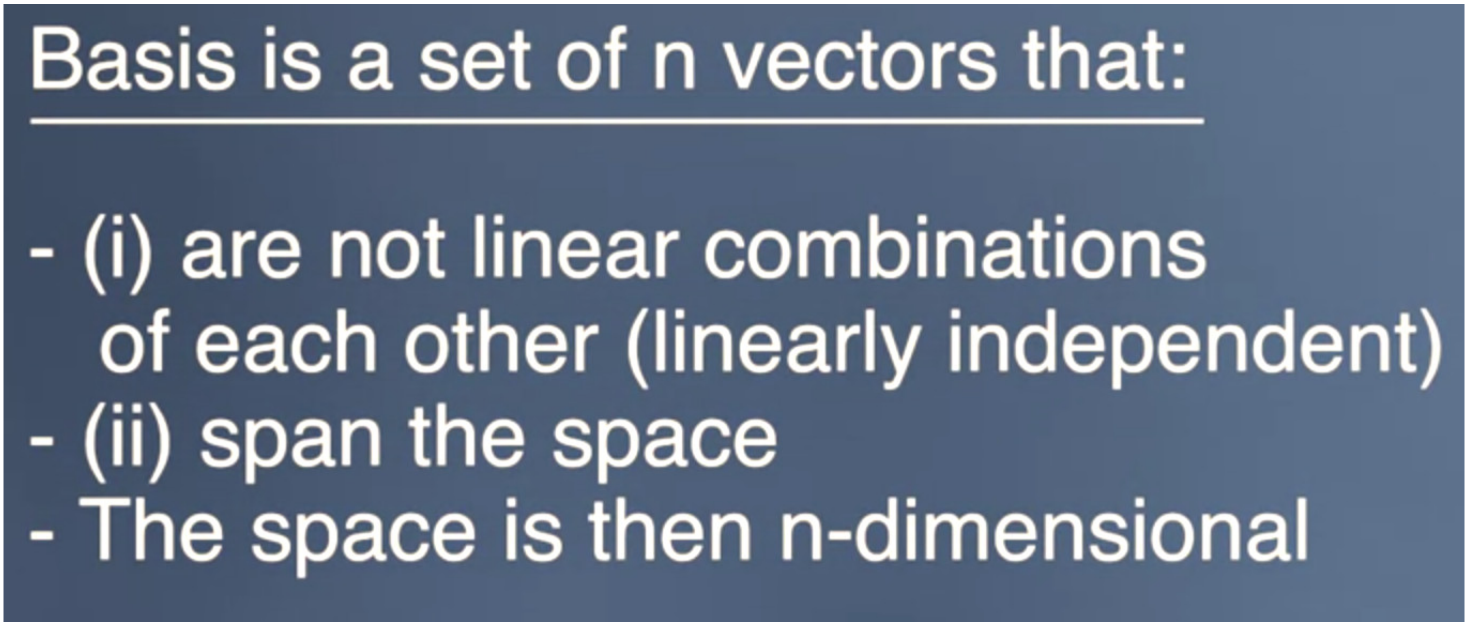
Scalar Projection $\frac{r*s}{|r|} = |s| \cos\theta$

Vector Projection $r * \frac{r*s}{|r||r|} = \frac{r*s}{r*r} * r$

Changing basis

Vectors we used to define a space called basis vectors

Basis, vector space, and linear independence



The first rule suggests that, if we have 3 basis vectors b_1, b_2, b_3, we could not find any numbers to satisify that:
$b_3 = \alpha * b_1 + \beta * b_2$, it called linear indepdent among basis vectors