Title: Galois calculations using Magma

Date: Feb 09, 2012 03:45 PM

URL: http://pirsa.org/12020149

Abstract:

Galois Calculations Using Magma

Symmetric Informationally Positive Operator Valued Measures

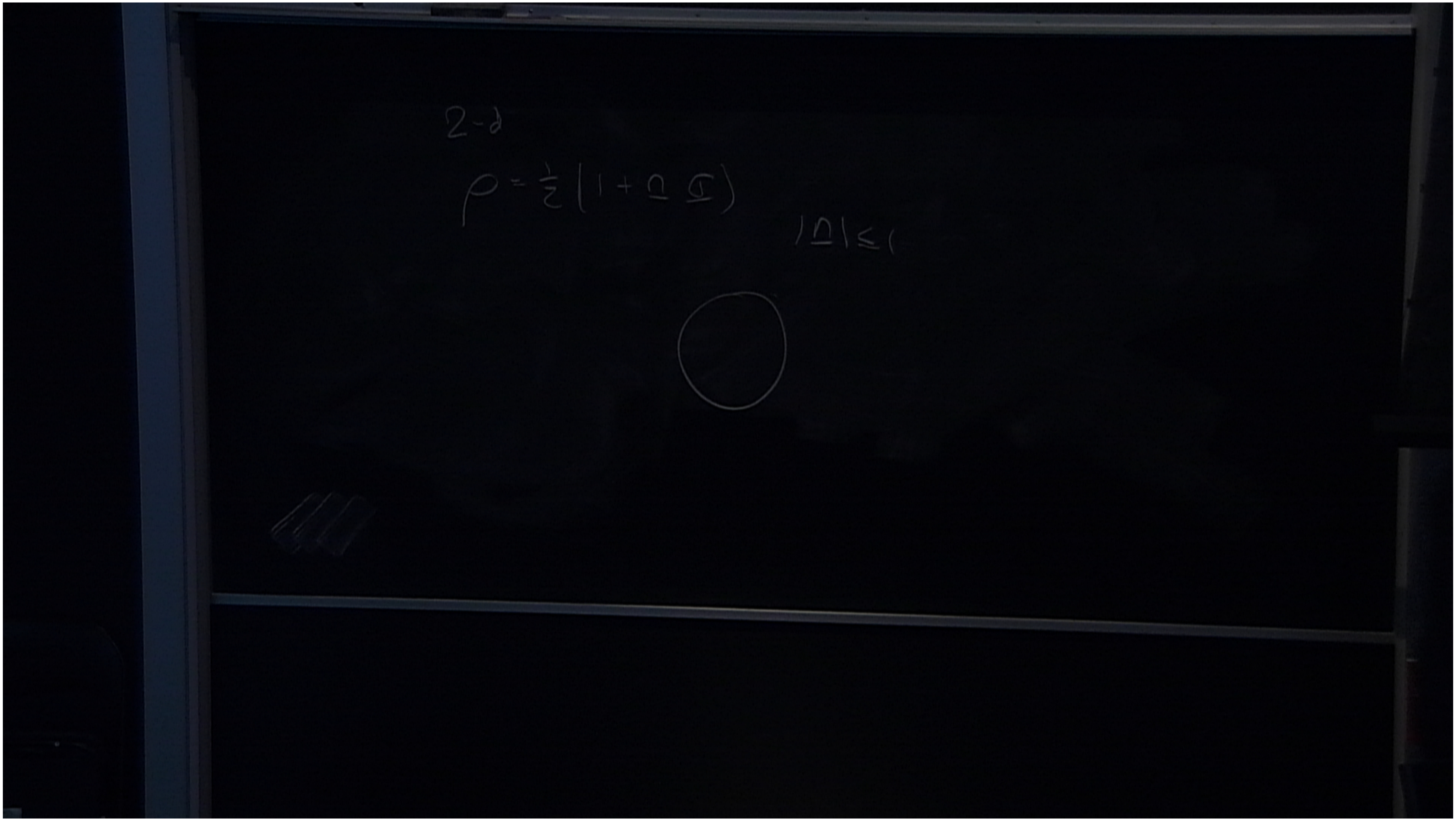
or, simply,

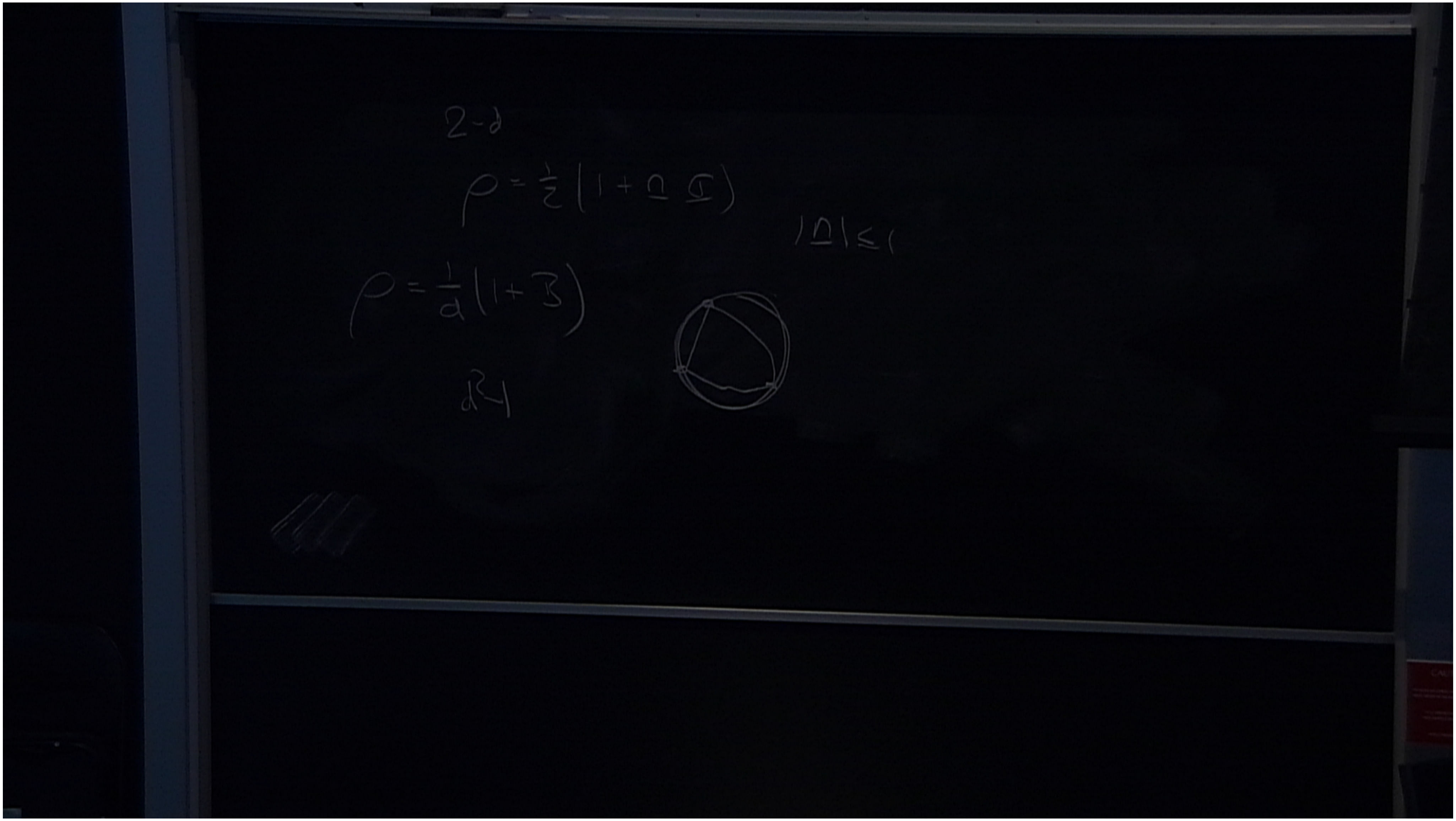
SICs

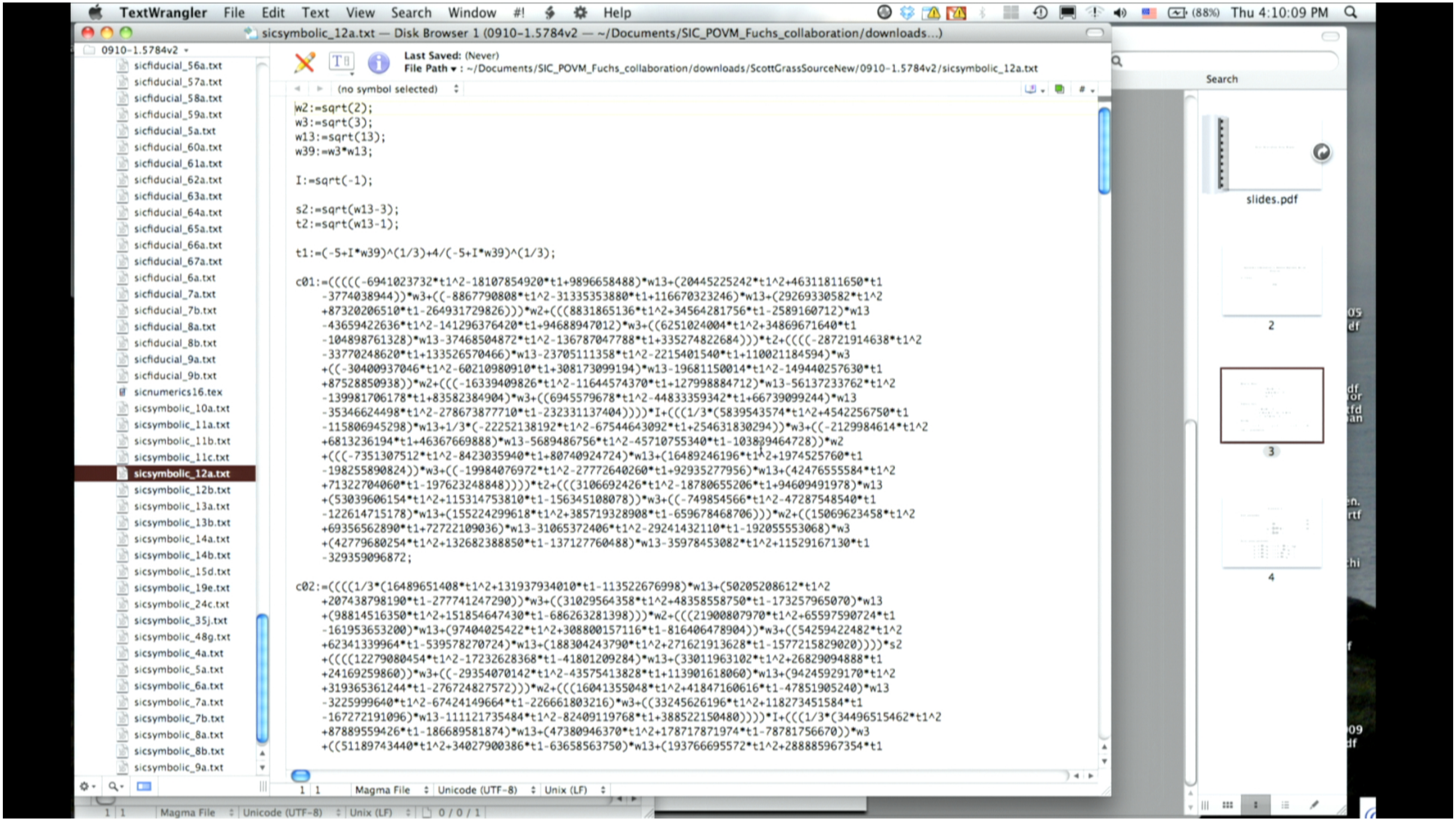
2-d

$$\rho = \frac{1}{2}\left(1 + \underline{n}\,\underline{\sigma}\right)$$

$$|\underline{n}| \leq 1$$


2-d
$\rho = \frac{1}{2}(1 + \underline{n} \cdot \underline{\sigma})$
$|\underline{n}| \leq 1$


2-d
ρ = ½(1 + n σ)
|n| ≤ 1
ρ = 1/d (1 + B)
d²-1



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(no symbol selected)
w2:=sqrt(2);
w3:=sqrt(3);
w13:=sqrt(13);
w39:=w3*w13;
I:=sqrt(-1);
s2:=sqrt(w13-3);
t2:=sqrt(w13-1);
t1:=(-5+I*w39)^(1/3)+4/(-5+I*w39)^(1/3);
c01:=(((((-6941023732*t1^2-18107854920*t1+9896658488)*w13+(20445225242*t1^2+46311811650*t1
-3774038944))*w3+((-8867790808*t1^2-31335353880*t1+116670323246)*w13+(29269330582*t1^2
+87320206510*t1-264931729826)))*w2+(((8831865136*t1^2+34564281756*t1-2589160712)*w13
-43659422636*t1^2-141296376420*t1+94688947012)*w3+((6251024004*t1^2+34869671640*t1
-104898761328)*w13-37468504872*t1^2-136787047788*t1+335274822684)))*t2+((((-28721914638*t1^2
-33770248620*t1+133526570466)*w13-23705111358*t1^2-2215401540*t1+110021184594)*w3
+((-30400937046*t1^2-60210980910*t1+308173099194)*w13-19681150014*t1^2-149440257630*t1
+87528850938))*w2+(((-16339409826*t1^2-11644574370*t1+127998884712)*w13-56137233762*t1^2
-139981706178*t1+83582384904)*w3+((6945579678*t1^2-44833359342*t1+66739099244)*w13
-35346624498*t1^2-278673877710*t1-232331137404))))*I+(((1/3*(5839543574*t1^2+4542256750*t1
-115806945298)*w13+1/3*(-22252138192*t1^2-67544643092*t1+254631830294))*w3+((-2129984614*t1^2
+6813236194*t1+46367669888)*w13-5689486756*t1^2-45710755340*t1-103839464728))*w2
+(((-7351307512*t1^2-8423035940*t1+80740924724)*w13+(16489246196*t1^2+1974525760*t1
-198255890824))*w3+((-19984076972*t1^2-27772640260*t1+92935277956)*w13+(42476555584*t1^2
+71322704060*t1-197623248848))))*t2+(((3106692426*t1^2-18780655206*t1+94609491978)*w13
+(53039606154*t1^2+115314753810*t1-156345108078))*w3+((-749854566*t1^2-47287548540*t1
-122614715178)*w13+(155224299618*t1^2+385719328908*t1-659678468706)))*w2+((15069623458*t1^2
+69356562890*t1+72722109036)*w13-31065372406*t1^2-29241432110*t1-192055553068)*w3
+(42779680254*t1^2+132682388850*t1-137127760488)*w13-35978453082*t1^2+11529167130*t1
-329359096872;
c02:=((((1/3*(16489651408*t1^2+131937934010*t1-113522676998)*w13+(50205208612*t1^2
+207438798190*t1-277741247290))*w3+((31029564358*t1^2+48358558750*t1-173257965070)*w13
+(98814516350*t1^2+151854647430*t1-686263281398)))*w2+(((21900807970*t1^2+65597590724*t1
-161953653200)*w13+(97404025422*t1^2+308800157116*t1-816406478904))*w3+((54259422482*t1^2
+62341339964*t1-539578270724)*w13+(188304243790*t1^2+271621913628*t1-1577215829020))))*s2
+((((12279080454*t1^2-17232628368*t1-41801209284)*w13+(33011963102*t1^2+26829094888*t1
+24169259860))*w3+((-29354070142*t1^2-43575413828*t1+113901618060)*w13+(94245929170*t1^2
+319365361244*t1-276724827572)))*w2+(((16041355048*t1^2+41847160616*t1-47851905240)*w13
-3225999640*t1^2-67424149664*t1-226661803216)*w3+((33245626196*t1^2+118273451584*t1
-167272191096)*w13-111121735484*t1^2-82409119768*t1+388522150480))))*I+(((1/3*(34496515462*t1^2
+87889559426*t1-186689581874)*w13+(47380946370*t1^2+178717871974*t1-78781756670))*w3
+((51189743440*t1^2+34027900386*t1-63658563750)*w13+(193766695572*t1^2+288885967354*t1
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Original Basis:

$$x+y+z-6$$
$$xy+yz+zx-11$$
$$xyz-6$$

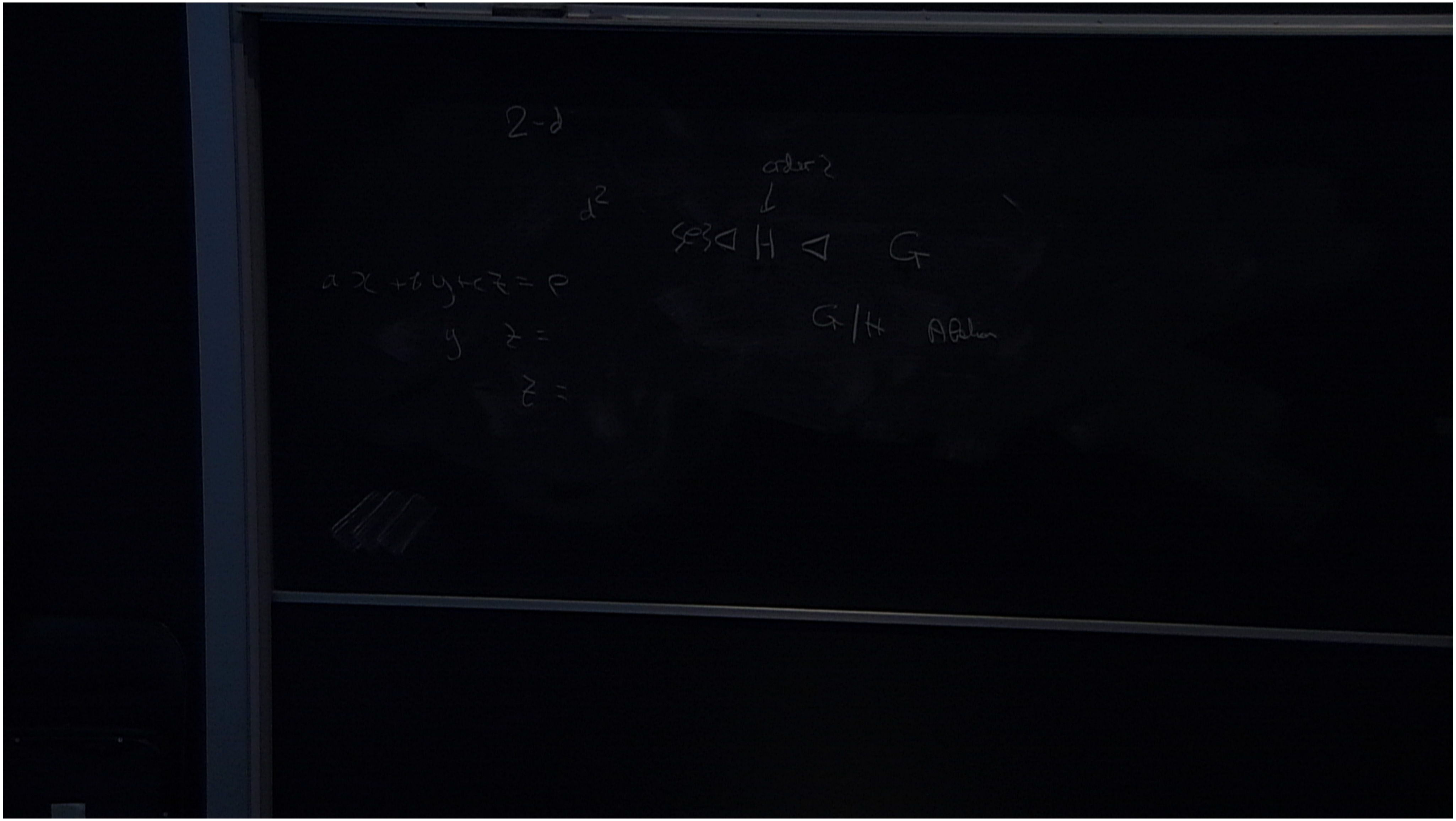
Gröbner basis:

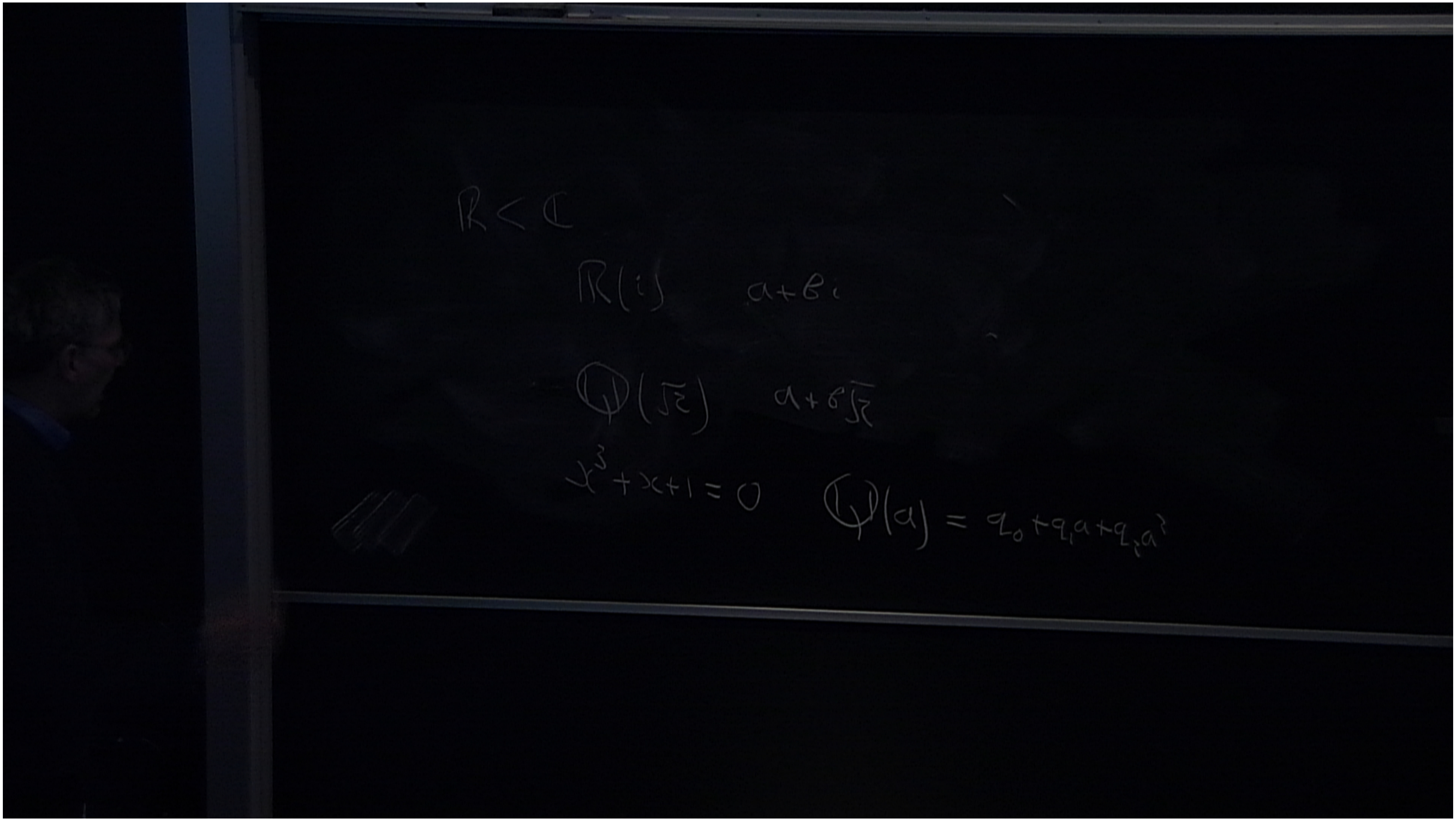
$$x+y+z-6$$
$$y^2+yz+z^2-6y-6z+11$$
$$z^3-6z^2+11z-6$$

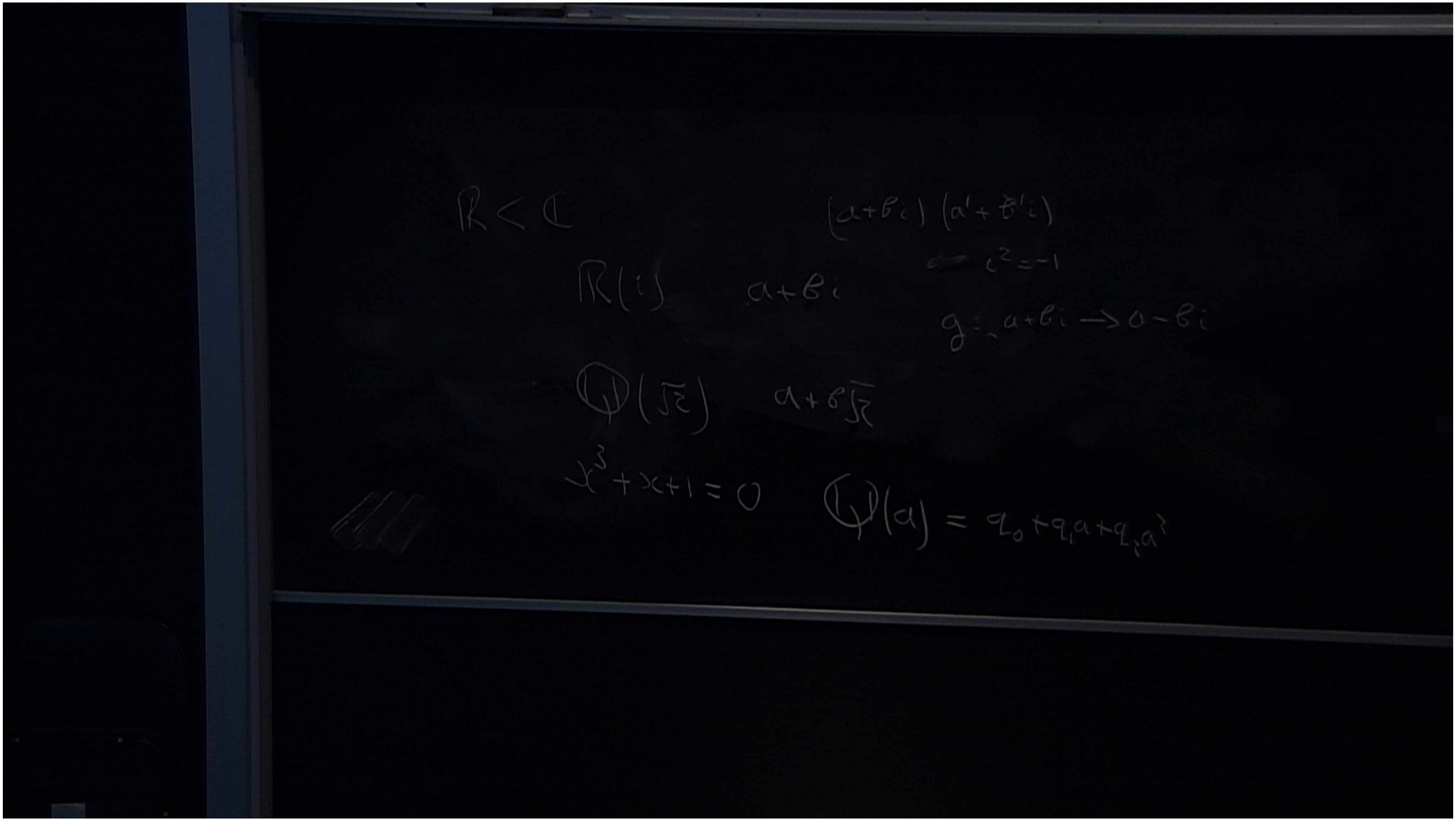
Variety:

$$x=1 \qquad y=2 \qquad z=3 \qquad (1)$$

and all permutations


2-d
d^2
order 2
$\{e\} \triangleleft H \triangleleft G$
$ax + by + cz = p$
$y \quad z =$
$z =$
G/H Abelian


$\mathbb{R} < \mathbb{C}$
$\mathbb{R}(i)$ $a+bi$
$\mathbb{Q}(\sqrt{2})$ $a+b\sqrt{2}$
$x^3+x+1=0$ $\mathbb{Q}(\alpha) = q_0+q_1\alpha+q_2\alpha^2$


$\mathbb{R} < \mathbb{C}$
$(a+bi)(a'+b'i)$
$i^2=-1$
$\mathbb{R}(i)$ $a+bi$
$g: a+bi \to a-bi$
$\mathbb{Q}(\sqrt{2})$ $a+b\sqrt{2}$
$x^3+x+1=0$ $\mathbb{Q}(a) = q_0+q_1a+q_2a^2$

Dimension 7

Field generators:

$$i \tag{2}$$

$$\sqrt{2} \tag{3}$$

$$r_+ = \sqrt{2\sqrt{2}+1} \tag{4}$$

$$r_- = \sqrt{2\sqrt{2}-1}$$

Galois group generators

$$g_1\colon (i, \sqrt{2}, r_+, r_-) \to (i, -\sqrt{2}, ir_-, ir_+)$$
$$g_2\colon (i, \sqrt{2}, r_+, r_-) \to (-i, \sqrt{2}, r_+, r_-)$$
$$g_3\colon (i, \sqrt{2}, r_+, r_-) \to (i, \sqrt{2}, -r_+, r_-)$$
$$g_4\colon (i, \sqrt{2}, r_+, r_-) \to (i, \sqrt{2}, r_+, -r_-)$$