

In[42]:=

```
<<NC`  
<<NCAlgebra`  
<<SDP`  
<<NCSE`  
<<NCSEBackwardsCompatible`
```

## Instruction (READ THIS FIRST)

In the following experiments, we used two different ways to generate linear functionals, i.e. random coefficient (RC) linear functionals and random positive trace (RPT) linear functionals.

The discrete uniform distribution used to generate the entries was changed over the course of the experiments.

The following three lines represent the different distributions we used. They are also repeated in the Experiments Chapter.

Please make sure to use the correct options to reproduce our experiment results.

```
(*RC: g3d4, g3d5, g3d6, g3d7, g4d4, g4d5, g4d6, g5d5, g5d6, g5d7*)  
SetOptions[GenerateExtremeAndAnalyze,  
  IntegerRange → {-200, 200}, StepDenominator → 100, MathematicaSDP → False];  
  
(*RPT: g3d4, g3d5, g3d6, g3d7, g4d4, g4d5, g4d6*)  
SetOptions[GenerateExtremeAndAnalyze,  
  IntegerRange → {-20, 20}, StepDenominator → 10, MathematicaSDP → False];  
  
(*RPT: g5d5, g5d6, g5d7*)  
SetOptions[GenerateExtremeAndAnalyze, IntegerRange → {-200 000, 200 000},  
  StepDenominator → 100 000, MathematicaSDP → False];
```

## Generating Spectrahedra

### g3d4

```
In[50]:= irredg3d4John1 = MakeIrreducibleA[3, 4, 555];  
irredg3d4John2 = MakeIrreducibleBoundedA[3, 4, 999 797 774];  
irredg3d4John3 = MakeIrreducibleBoundedA[3, 4, 999 794];  
irredg3d4John4 = MakeIrreducibleBoundedA[3, 4, 9 992 797 774];  
irredg3d4John5 = MakeIrreducibleBoundedA[3, 4, 9 797 774];  
irredg3d4John6 = MakeIrreducibleBoundedA[3, 4, 100 797 774];
```

### g3d5

### g3d6

g3d7

g4d4

g4d5

g4d6

g5d5

g5d6

g5d7

## Experiments

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RC: [-200,200]/100

```
In[91]:= SetOptions[GenerateExtremeAndAnalyze,
  IntegerRange → {-200, 200}, StepDenominator → 100, MathematicaSDP → False];
```

g3d4

irredg3d4John1

```
In[ ]:= For[i=2,i<5,i++,GenerateExtremeAndAnalyze[irredg3d4John1,i,50000,151410,OutputFile→"~/Irr
```

```
In[ ]:= For[i=1,i≤8,i++,GenerateExtremeAndAnalyze[irredg3d4John1,i,2000,51410];]
```

irredg3d4John2

irredg3d4John3

irredg3d4John4

irredg3d4John5

irredg3d4John6

g3d5

g3d6

g3d7

g4d4

g4d5

g4d6

g5d5

g5d6

g5d7

---

RPT: [-20,20]/10

```
In[134]:= SetOptions[GenerateExtremeAndAnalyze,
  IntegerRange → {-20, 20}, StepDenominator → 10, MathematicaSDP → False];
```

g3d4

g3d5

g3d6

g3d7

g4d4

g4d5

g4d6

---

RPT: [-200000,200000]/100000

```
SetOptions[GenerateExtremeAndAnalyze, IntegerRange → {-200 000, 200 000},
  StepDenominator → 100 000, MathematicaSDP → False];
```

g5d5

g5d6

g5d7