- **Claim: When Metaclass IV factorises into a double light cone, the null cone intersection is two lines.**
- **Define Lorentz null cones**

In[1]:=
$$AA = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1}{2}\left(-D1+\sqrt{4+D1^2}\right) & 0 & 0 \\ 0 & 0 & \frac{1}{2}\left(-D1+\sqrt{4+D1^2}\right) & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix};$$

$$BB = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1}{2}\left(-D1-\sqrt{4+D1^2}\right) & 0 & 0 \\ 0 & 0 & \frac{1}{2}\left(-D1-\sqrt{4+D1^2}\right) & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix};$$

- **Suppose v is a null vector for both Lorentz metrics**

In[3]:=
```
v = {a0, a1, a2, a3}
```

Out[3]= {a0, a1, a2, a3}

In[4]:=
```
p0 = v.AA.v;
p1 = v.BB.v;
```

- **If p0 = 0 and p1 = 0, then it follows that p0-p1 = 0.**

In[6]:=
```
Simplify[p0 - p1]
```

Out[6]= $\left(a1^2 + a2^2\right)\sqrt{4 + D1^2}$

- **It follows that a1=a2=0**

In[7]:=
```
Simplify[{p0, p1} /. {a1 → 0, a2 → 0}]
```

Out[7]= $\left\{a0^2 - a3^2,\ a0^2 - a3^2\right\}$

- **It follows that a0 = +/- a3**
- **Check**

In[8]:=
```
vec = {t, 0, 0, s};

vec.AA.vec
vec.BB.vec
```

Out[9]= $-s^2 + t^2$

Out[10]= $-s^2 + t^2$