Inverse of a Pauli Matrix

Taper, 2017-Apr-25th

In general, a pauli matrix having the form:

```
aMat = a * PauliMatrix[0] + b * PauliMatrix[1] + c * PauliMatrix[2] + d * PauliMatrix[3];
```

Has an inverse:

In[61]:=
```
cof = {-a/(-a^2+b^2+c^2+d^2), b/(-a^2+b^2+c^2+d^2), c/(-a^2+b^2+c^2+d^2), d/(-a^2+b^2+c^2+d^2)};
```

```
aInverse = cof[[1]] * PauliMatrix[0] + cof[[2]] * PauliMatrix[1] +
    cof[[3]] * PauliMatrix[2] + cof[[4]] * PauliMatrix[3];
aInverse // MatrixForm
```

Out[63]//MatrixForm=

$$\begin{pmatrix} -\frac{a}{-a^2+b^2+c^2+d^2}+\frac{d}{-a^2+b^2+c^2+d^2} & \frac{b}{-a^2+b^2+c^2+d^2}-\frac{i\,c}{-a^2+b^2+c^2+d^2} \\ \frac{b}{-a^2+b^2+c^2+d^2}+\frac{i\,c}{-a^2+b^2+c^2+d^2} & -\frac{a}{-a^2+b^2+c^2+d^2}-\frac{d}{-a^2+b^2+c^2+d^2} \end{pmatrix}$$

As confirmed by:

In[65]:=
```
FullSimplify[aMat.aInverse] // MatrixForm
```

Out[65]//MatrixForm=

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$