Pensieve header: A determinant bug in mathematica version 9 - this notebook was evaluated on version 8, and there's no bug.

```
$Version
```

```
8.0 for Microsoft Windows (64-bit) (October 7, 2011)
```

mat is a 2x2 matrix with entries rational functions in x, y, z.

```
{{a, b}, {c, d}} =
  mat = {{-1 - (z (1 - 2 x + x^2 - y + 3 x y - 2 x^2 y - x y^2 + x^2 y^2 - z + 2 x z - x^2 z + y z -
              5 x y z + 3 x^2 y z + 2 x y^2 z - 2 x^2 y^2 z + x y z^2 - x^2 y z^2 - x y^2 z^2 + x^2 y^2 z^2)) /
          (1 - 2 x + x^2 - 2 y + 4 x y - 2 x^2 y + y^2 - 2 x y^2 + x^2 y^2 - 2 z + 4 x z - 2 x^2 z + 4 y z -
            10 x y z + 6 x^2 y z - 2 y^2 z + 8 x y^2 z - 5 x^2 y^2 z - x y^3 z + x^2 y^3 z + z^2 - 2 x z^2 +
            x^2 z^2 - 2 y z^2 + 8 x y z^2 - 5 x^2 y z^2 + y^2 z^2 - 8 x y^2 z^2 + 6 x^2 y^2 z^2 + 2 x y^3 z^2 -
            2 x^2 y^3 z^2 - x y z^3 + x^2 y z^3 + 2 x y^2 z^3 - 2 x^2 y^2 z^3 - x y^3 z^3 + x^2 y^3 z^3),
       (y (-1 + z) (1 - 2 x + x^2 + x y - x^2 y + x z - x^2 z - 3 x y z + 2 x^2 y z + x y^2 z -
              x^2 y^2 z + x y z^2 - x^2 y z^2 - x y^2 z^2 + x^2 y^2 z^2)) /
          (1 - 2 x + x^2 - 2 y + 4 x y - 2 x^2 y + y^2 - 2 x y^2 + x^2 y^2 - 2 z + 4 x z - 2 x^2 z + 4 y z -
            10 x y z + 6 x^2 y z - 2 y^2 z + 8 x y^2 z - 5 x^2 y^2 z - x y^3 z + x^2 y^3 z + z^2 - 2 x z^2 +
            x^2 z^2 - 2 y z^2 + 8 x y z^2 - 5 x^2 y z^2 + y^2 z^2 - 8 x y^2 z^2 + 6 x^2 y^2 z^2 + 2 x y^3 z^2 -
            2 x^2 y^3 z^2 - x y z^3 + x^2 y z^3 + 2 x y^2 z^3 - 2 x^2 y^2 z^3 - x y^3 z^3 + x^2 y^3 z^3)},
      {((-1 + y) z (1 - 2 x + x^2 - y + 2 x y - x^2 y - z + 2 x z - x^2 z + y z - 5 x y z +
              3 x^2 y z + x y^2 z - x^2 y^2 z + x y z^2 - x^2 y z^2 - x y^2 z^2 + x^2 y^2 z^2)) /
          (1 - 2 x + x^2 - 2 y + 4 x y - 2 x^2 y + y^2 - 2 x y^2 + x^2 y^2 - 2 z + 4 x z - 2 x^2 z + 4 y z -
            10 x y z + 6 x^2 y z - 2 y^2 z + 8 x y^2 z - 5 x^2 y^2 z - x y^3 z + x^2 y^3 z + z^2 - 2 x z^2 +
            x^2 z^2 - 2 y z^2 + 8 x y z^2 - 5 x^2 y z^2 + y^2 z^2 - 8 x y^2 z^2 + 6 x^2 y^2 z^2 + 2 x y^3 z^2 -
            2 x^2 y^3 z^2 - x y z^3 + x^2 y z^3 + 2 x y^2 z^3 - 2 x^2 y^2 z^3 - x y^3 z^3 + x^2 y^3 z^3),
       -1 - (y (1 - 2 x + x^2 - y + 2 x y - x^2 y - z + 3 x z - 2 x^2 z + y z - 5 x y z + 3 x^2 y z +
              x y^2 z - x^2 y^2 z - x z^2 + x^2 z^2 + 2 x y z^2 - 2 x^2 y z^2 - x y^2 z^2 + x^2 y^2 z^2)) /
          (1 - 2 x + x^2 - 2 y + 4 x y - 2 x^2 y + y^2 - 2 x y^2 + x^2 y^2 - 2 z + 4 x z - 2 x^2 z + 4 y z -
            10 x y z + 6 x^2 y z - 2 y^2 z + 8 x y^2 z - 5 x^2 y^2 z - x y^3 z + x^2 y^3 z + z^2 - 2 x z^2 +
            x^2 z^2 - 2 y z^2 + 8 x y z^2 - 5 x^2 y z^2 + y^2 z^2 - 8 x y^2 z^2 + 6 x^2 y^2 z^2 + 2 x y^3 z^2 -
            2 x^2 y^3 z^2 - x y z^3 + x^2 y z^3 + 2 x y^2 z^3 - 2 x^2 y^2 z^3 - x y^3 z^3 + x^2 y^3 z^3)}};
```

The determinant of mat as computed by Det is not the same as ad-bc:

```
diff = Simplify[a * d - b * c - Det[mat]]
```

```
0
```

And the difference is not merely a failure of Simplify; indeed the difference diff is non-zero even when specialized to numerical values of x, y, z:

```
vals = Thread[{x, y, z} → N[{Sqrt[2], π, E}]]
```

```
{x → 1.41421, y → 3.14159, z → 2.71828}
```

```
diff /. vals
```

```
0
```

```
(a * d - b * c /. vals) - Det[mat /. vals]
```

$$1.249 \times 10^{-16}$$