CoCoALib - Bug #1310

RealRoots: gives odd number of roots for deg 6 irred poly

10 Sep 2019 13:53 - John Abbott

| Status: | Closed | Start date: | 10 Sep 2019 |
|--|--------------------------------|-----------------|-------------|
| Priority: | Urgent | Due date: | |
| Assignee: | John Abbott | % Done: | 100% |
| Category: | Maths Bugs | Estimated time: | 2.22 hours |
| Target version: | CoCoALib-0.99650 November 2019 | Spent time: | 2.30 hours |
| Description | | | |
| The following looks to be wrong: | | | |
| | | | |
| $/**/$ f := x^6 + 4*x^5 - x^3 - 4*x^2 -1; | | | |
| /**/ IsIrred(f); | | | |
| true | | | |
| <pre>/**/ len(RealRoots(f)); must be even!</pre> | | | |
| 1 | | | |
| <pre>/**/ RootBound(f);</pre> | | | |
| 189/64 | | | |
| | | | |

History

#1 - 10 Sep 2019 17:32 - John Abbott

- Status changed from New to In Progress

- % Done changed from 0 to 10

There appear to be two real roots: approx -4.00095 and 1.05

RootBound(f) gives about 2.95; this is wrong!

#2 - 11 Sep 2019 10:30 - John Abbott

- Assignee set to John Abbott

- % Done changed from 10 to 30

I now have a simpler failing example:

```
g := x^4 - 288*x^3 - 593*x + 256;
RootBound(g,0); --> 254, but there is a real root close to 288.01
```

Verbose mode shows that the "Birkhoff" bound is wrong. Investigating...

#3 - 11 Sep 2019 11:29 - John Abbott

- Status changed from In Progress to Feedback
- % Done changed from 30 to 90
- Estimated time set to 2.22 h

I have found a bug, and fixed it! It produces reasonable answers on the two tests mentioned above:

```
/**/ gg := x^4 -288*x^3 -593*x +256;
/**/ RootBound(gg);
289
/**/ f := x^6 +4*x^5 -x^3 -4*x^2 -1;
/**/ FloatStr(RootBound(f));
4.0156
```

I'll add a new "exbug" test. Phew!

#4 - 10 Oct 2019 18:50 - Anna Maria Bigatti

- Target version changed from CoCoALib-0.99700 to CoCoALib-0.99650 November 2019

#5 - 14 Oct 2019 15:01 - John Abbott

- Status changed from Feedback to Closed
- % Done changed from 90 to 100