

## CoCoALib - Bug #1310

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

10 Sep 2019 13:53 - John Abbott

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

#### 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