Übungen am 29.11.2001

Übungen zu "Computergestütztes symbolisches Rechnen" im Wintersemester 2001/02, Institut für Informatik der Universität München

Aufgabe 5, 1. und 2.

```
> restart;
> with(Ore_algebra): with(Groebner):
> A:=poly_algebra(x,y,z);
```

$$A := Ore_algebra$$

```
> M:=[[1,1,1],[1,0,0],[0,1,0]];
```

$$M := [[1, 1, 1], [1, 0, 0], [0, 1, 0]]$$

```
> grlex:=termorder(A,'matrix'(M,[x,y,z]));
```

$$grlex := term_order$$

```
> f:= x^7*y^2 + x^3*y^2 - y +1;
```

$$f := x^7 y^2 + x^3 y^2 - y + 1$$

```
> gg:=[x*y^2 -x,x-y^3];
```

$$gg := [x y^2 - x, x - y^3]$$

```
> reduce(f,gg,plex(x,y));
```

$$-y + 1 + 2 y^3$$

```
> gg1:=[x-y^3,x*y^2 -x];
```

$$gg1 := [x - y^3, x y^2 - x]$$

```
> reduce(f,gg1,plex(x,y));
```

$$-y + 1 + y^{23} + y^{11}$$

```
> reduce(f,gg,grlex);
```

$$x^7 + x^3 - y + 1$$

```
> reduce(f,gg1,grlex);
```

$$x^7 + x^3 - y + 1$$

Aufgabe 5, 3. und 4.

```
> f:=x*y^2*z^2+x*y-y*z;
```

$$f := x y^2 z^2 + x y - y z$$

```
> g1:=x-y^2;
```

$$g1 := x - y^2$$

```
> g2:=y-z^3;
```

$$g2 := y - z^3$$

```
> g3:=z^2-1;
```

$$g3 := z^2 - 1$$

```
> reduce(f,[g1,g2,g3],plex(x,y,z));
```

$$z$$

```
> reduce(f,[g2,g3,g1],plex(x,y,z));
```

$$z$$

```
> reduce(f,[g3,g1,g2],plex(x,y,z));
```

$$z$$

Nachrechnen für g1,g2,g3:

```
> simplify(f-g1*(y^2*z^2+y)-g2*(y^3*z^2+y^2*z^5+y^2+y*z^8+y*z^3
  +z^11+z^6-z)-g3*(z^12+z^10+z^8+z^7+z^6+z^5+z^4+z^3+z));
```

$$z$$

Nun für g2,g3,g1:

```
> simplify(f-g2*(x*y*z^2+x*z^5+x+y*z+y+z^4+z^3-z)-g3*(x*z^6+x*z
  ^4+x*z^2+x*z+x+z^5+z^4+z^3+z)-g1*(z+1));
```

$$z$$

Nun für g3,g1,g2:

```
> simplify(f-g3*(x*y^2+y^3*z+y^2*z^2+y^2*z+y^2+y*z^2+y*z+y+z)-g
  1*(y^2+y)-g2*(y^3+y^2*z+y^2+y*z+y+1));
```

$$z$$

Zum Spass noch mit grlex.

```
> reduce(f,[g1,g2,g3],grlex);
```

$$x\,y - y\,z + x^2$$

```
> simplify(f-g1*(-x*z^2)-g3*(x^2));
```

$$x\,y - y\,z + x^2$$

```
> reduce(f,[g2,g3,g1],grlex);
```

$$x\,y - y\,z + x^2$$

```
> simplify(f-g3*(x*y^2)-g1*(-x));
```

$$x\,y - y\,z + x^2$$

```
> reduce(f,[g3,g1,g2],grlex);
```

$$x\,y - y\,z + x^2$$

```
> simplify(f-g3*(x*y^2)-g1*(-x));
```

$$x\,y - y\,z + x^2$$

Aufgabe 6

```
> g1:=2*x*y^2-x;
```

$$g1 := 2\,x\,y^2 - x$$

```
> g2:=3*x^2*y-y-1;
```

$$g2 := 3\,x^2\,y - y - 1$$

```
> f:=simplify(g1*3*x-g2*2*y);
```

$$f := -3\,x^2 + 2\,y^2 + 2\,y$$

```
> reduce(f,[g1,g2],grlex);
```

$$-3\,x^2 + 2\,y^2 + 2\,y$$