Blatt 7

Aufgabe 26

```
> restart:
> with(plots):
> P := (x, y) -> 6*x*y - 3*y^2 - 4*x^4 + 8*x^3*y - 24*x^2*y^2 +
  20*x*y^3 - 25*y^4 - a;
> as := [ -1/10, 0, 1/10 ]:
> for kk from 1 to nops(as) do
    #solutions_y := allvalues(solve(subs(a = as[kk], P(x, y)) =
  0, y)):
    solutions := [ allvalues(solve(subs(a = as[kk], P(x, y)) = 0,
  { x,y })) ]:

    # Polynomial and z-plane
    p0 := plot3d(subs(a = as[kk], P(x, y)), x = -1..1, y= -0.5.
  .0.5):
    pz := plot3d([ x, y, 0 ], x = -1..1, y= -0.5..0.5, color =
  yellow, transparency = 0.5):

    # Plot of the zeros
    colors := [ blue, red, green, purple ];
    p := [ seq(0, ll = 1..nops(solutions)) ];
    for ll from 1 to nops(solutions) do
      p[ll] := spacecurve([ rhs(solutions[ll][1]), rhs(solutions
  [ll][2]), 0 ], y = -1..1, color = colors[ll], thickness = 10):
    end do;

    # Show it!
    p := [ op(p), p0, pz ];
    print(display(p, view = [ -1..1, -1/2..1/2, -1..1],
  orientation = [ 48, 22, 4 ]));
  end do:
```

Aufgabe 27

```
> restart:
```

(a)

```
> f := arctan(x) * exp(1 + x^3) * ln(x^2 + 1);
> df  := diff(f, x);
> d2f := diff(f, x$2);
> collect(df, [exp(1+x^3),arctan(x),ln(x^2+1)]);
> collect(d2f, [exp(1+x^3),arctan(x),ln(x^2+1)]);
```

(b)

```
> b := cos(2*arctan(x));
```

```
> b = simplify(b);
> expand(b);
> normal(expand(b));
> normal(expand(b), expanded);
> normal(simplify(expand(b)));
> normal(simplify(expand(b)),expanded);

> convert(b,tan);
> simplify(convert(b,tan));

> L := trigsubs(b);
> b = normal(L[7]);
```

Aufgabe 28

```
> restart:
```

(a)

```
> a := y^2;
> sqrt(a);
> sqrt(a) assuming y>=0;
> sqrt(a) assuming y<0;
```

(b)

```
> sin(n*Pi/2) assuming n::even;
> sin(n*Pi/2) assuming n::odd;
```

Aufgabe 29

```
> restart:
> with(LinearAlgebra):
```

(a)

```
> M := <<1,5,3,4>|<3,1,2,0>>;
> N := Transpose(M);
> MMt := M . N;
> MtM := N . M;
> Rank(MMt);
> Determinant(MMt);
> Rank(MtM);
> Determinant(MtM);
```

(b)

```
> S := SubMatrix(MMt, 2..3, 2..3);
> (S^2) . (L^(-1));
```

(c)

```
> T := MMt + Matrix(<0,1+2*t,1-3*t,0>, shape = diagonal);
> q := Determinant(T);
```

```
> solve(q);
```