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Практическое знакомство с графическими дополнениями
L^AT_EX(MetaPost, PSTricks)

ОТЧЕТ
по лабораторной работе № 4

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Группа:

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Глава 1

Качественное решение ДУ. Поле направлений

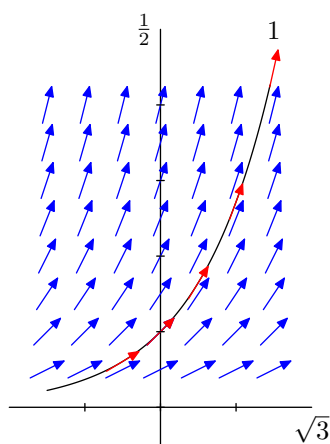


Рис. 1.1: 1-й скрипт

1-ый скрипт

```
beginfig(1);  
% TODO: Прокомментировать  
% some constants  
numeric xmin, xmax, ymin, ymax, xinc, u;  
xmin := -1.5;  
xmax := 1.5;  
ymin := 0;  
ymax := 4.5;  
xinc := 0.05;  
  
u := 1cm;  
  
% draw axes  
draw (xmin-0.5,0)*u--(xmax+0.5,0)*u;
```

```

draw (0,ymin-0.5)*u--(0,ymax+0.5)*u;

% define f making up the ODE  $y' = f(x,y)$ . Here we take  $y' = y$ 
% with the exponential curve as solution curve
vardef f(expr x,y) = y enddef;

% define routine to compute function values
def compute_curve(suffix g)(expr xmin, xmax, xinc) =
  ( (xmin, g(xmin))
  for x=xmin+xinc step xinc until xmax: .. (x,g(x)) endfor )
enddef;

% compute and draw exponential curve
vardef exp(expr x) = (mexp 256)**x enddef;

path p;
p := compute_curve(exp, xmin, xmax, xinc) scaled u;
draw p;

% draw direction field
pair vec; path v;
for x=xmin step 0.5 until xmax:
  for y=ymin+0.5 step 0.5 until ymax-0.5:
    vec := unitvector( (1,f(x,y)) ) scaled 1/2u;
    v := ((0,0)--vec) shifted -1/2vec;
    drawarrow v shifted (x*u,y*u) withcolor blue;
  endfor;
endfor;

% draw directions along the exponential curve
for x=-0.5 step 0.5 until xmax:
  vec := unitvector( (1,f(x,exp(x))) ) scaled 1/2u;
  v := ((0,0)--vec) shifted -1/2vec;
  drawarrow v shifted (x*u,exp(x)*u) withcolor red;
endfor;

% draw ticks and labels
for x=round(xmin) upto xmax:
  draw (x,-0.05)*u--(x,0.05)*u;
endfor;

for y=round(ymin) upto ymax:
  draw (-0.05,y)*u--(0.05,y)*u;
endfor;

label.bot(btex  $x$  etex, (xmax+0.5,0)*u);
label.lft(btex  $y$  etex, (0,ymax+0.5)*u);

```

```
label(btex  $y=e^x$  etex, (xmax, exp(xmax)+0.5)*u);

endfig;
end;
```

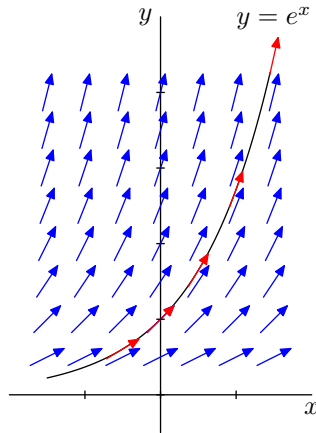


Рис. 1.2: Переписанный 1-ый скрипт

Переписанный 1-ый скрипт

```
beginfig(1);
% TODO: Переписать на свое ДУ
% some constants
numeric xmin, xmax, ymin, ymax, xinc, u;
xmin := -1.5;
xmax := 1.5;
ymin := 0;
ymax := 4.5;
xinc := 0.05;

u := 1cm;

% draw axes
draw (xmin-0.5,0)*u--(xmax+0.5,0)*u;
draw (0,ymin-0.5)*u--(0,ymax+0.5)*u;

% define f making up the ODE  $y' = f(x,y)$ . Here we take  $y' = y$ 
% with the exponential curve as solution curve
vardef f(expr x,y) = y enddef;

% define routine to compute function values
def compute_curve(suffix g)(expr xmin, xmax, xinc) =
( (xmin, g(xmin))
for x=xmin+xinc step xinc until xmax: .. (x,g(x)) endfor )
```

```

enddef;

% compute and draw exponential curve
vardef exp(expr x) = (mexp 256)**x enddef;

path p;
p := compute_curve(exp, xmin, xmax, xinc) scaled u;
draw p;

% draw direction field
pair vec; path v;
for x=xmin step 0.5 until xmax:
  for y=ymin+0.5 step 0.5 until ymax-0.5:
    vec := unitvector( (1,f(x,y)) ) scaled 1/2u;
    v := ((0,0)--vec) shifted -1/2vec;
    drawarrow v shifted (x*u,y*u) withcolor blue;
  endfor;
endfor;

% draw directions along the exponential curve
for x=-0.5 step 0.5 until xmax:
  vec := unitvector( (1,f(x,exp(x))) ) scaled 1/2u;
  v := ((0,0)--vec) shifted -1/2vec;
  drawarrow v shifted (x*u,exp(x)*u) withcolor red;
endfor;

% draw ticks and labels
for x=round(xmin) upto xmax:
  draw (x,-0.05)*u--(x,0.05)*u;
endfor;

for y=round(ymin) upto ymax:
  draw (-0.05,y)*u--(0.05,y)*u;
endfor;

label.bot(btex  $x$  etex, (xmax+0.5,0)*u);
label.lft(btex  $y$  etex, (0,ymax+0.5)*u);
label(btex  $y=e^x$  etex, (xmax, exp(xmax)+0.5)*u);

endfig;
end;

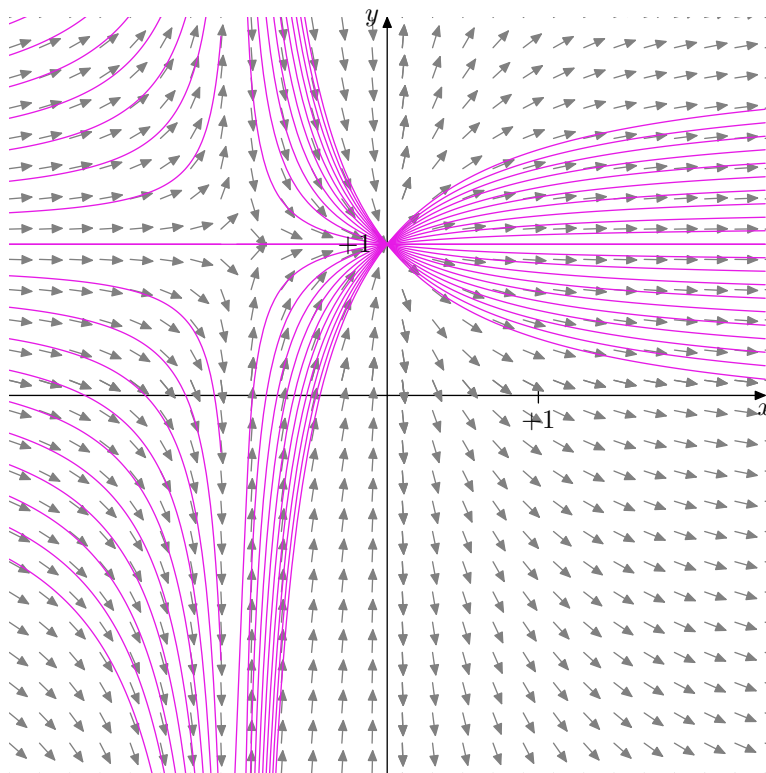
```

2-ый скрипт

```

verbatimtex
% TODO: Прокомментировать

```



$$(x + x^2)y' - y = -1$$

Рис. 1.3: 2-й скрипт

```
%&latex
\documentclass{article}
\begin{document}
etex

input courbes;

vardef fx(expr t) = t enddef;
vardef fy(expr t) = 1+a*t/(1+t) enddef;

beginfig(1);
  repere(10cm,10cm,5cm,5cm,2cm,2cm);
  trace.axes(0.5pt);
  marque.unites(1mm);

  %% Champs de vecteurs
  vardef F(expr x,y) = (y-1)/(x+x**2) enddef;

  champ.vecteurs(0.1,0.1,0.2,0.15,0.5white);

  %% Courbes integrales
```

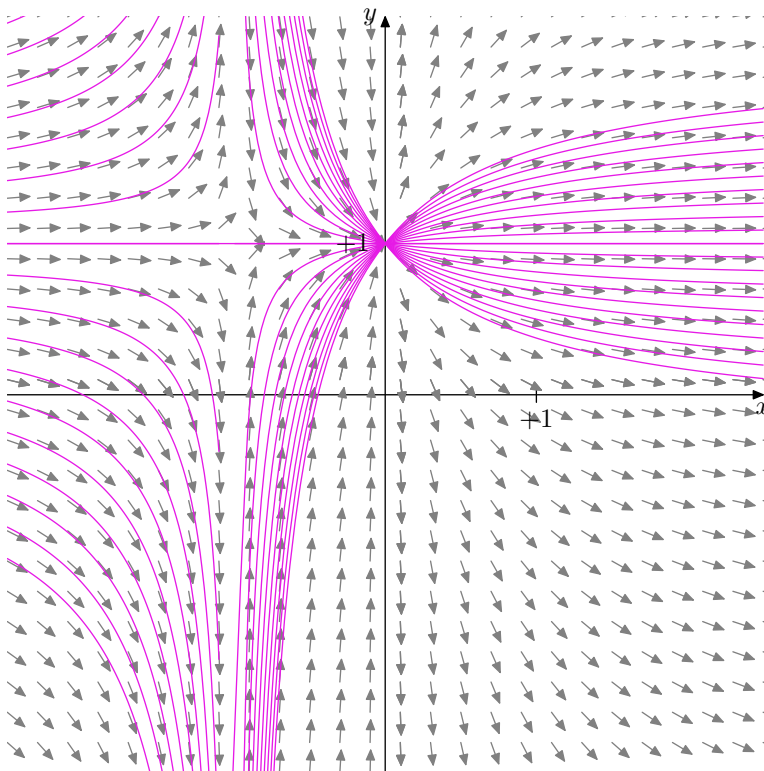
```

color la_couleur;
la_couleur = (0.9,0.1,0.9);
for n = 0 upto 20:
  a := (n/8) - 1.25;
  draw ftrace(-0.995,2.5,50) en_place withcolor la_couleur;
  draw ftrace(-2.5,-1.1,50) en_place withcolor la_couleur;
endfor;

draw rpoint(r_xmin,1)--rpoint(r_xmax,1) withcolor la_couleur;
decoupe.repere;
etiquette.axes;
etiquette.unites;
label(btex  $(x+x^2)y'-y=-1$  etex scaled 2.5,rpoint(0,-3));

endfig;
end;

```



$$(x + x^2)y' - y = -1$$

Рис. 1.4: Переписанный 2-ый скрипт

Переписанный 2-ый скрипт

verbatimtex

```

% TODO: Сделать свой пример ДУ
%&latex
\documentclass{article}
\begin{document}
etex

input courbes;

vardef fx(expr t) = t enddef;
vardef fy(expr t) = 1+a*t/(1+t) enddef;

beginfig(1);
repere(10cm,10cm,5cm,5cm,2cm,2cm);
trace.axes(0.5pt);
marque.unites(1mm);

%% Champs de vecteurs
vardef F(expr x,y) = (y-1)/(x+x**2) enddef;

champ.vecteurs(0.1,0.1,0.2,0.15,0.5white);

%% Courbes integrales
color la_couleur;
la_couleur = (0.9,0.1,0.9);
for n = 0 upto 20:
  a := (n/8) - 1.25;
  draw ftrace(-0.995,2.5,50) en_place withcolor la_couleur;
  draw ftrace(-2.5,-1.1,50) en_place withcolor la_couleur;
endfor;

draw rpoint(r_xmin,1)--rpoint(r_xmax,1) withcolor la_couleur;
decoupe.repere;
etiquette.axes;
etiquette.unites;
label(btex  $(x+x^2)y'-y=-1$  etex scaled 2.5,rpoint(0,-3));

endfig;
end;

```


Глава 2

3d чертежи с использованием MetaPost (Asymptote, Ps-Tricks)

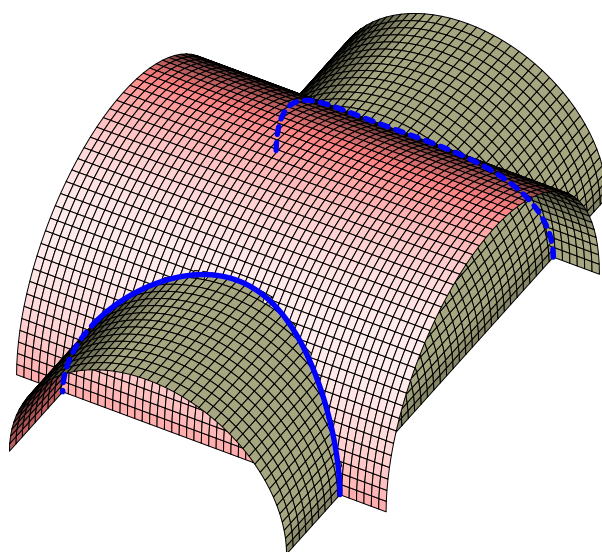


Рис. 2.1: Intersection de deux demi-cylindres

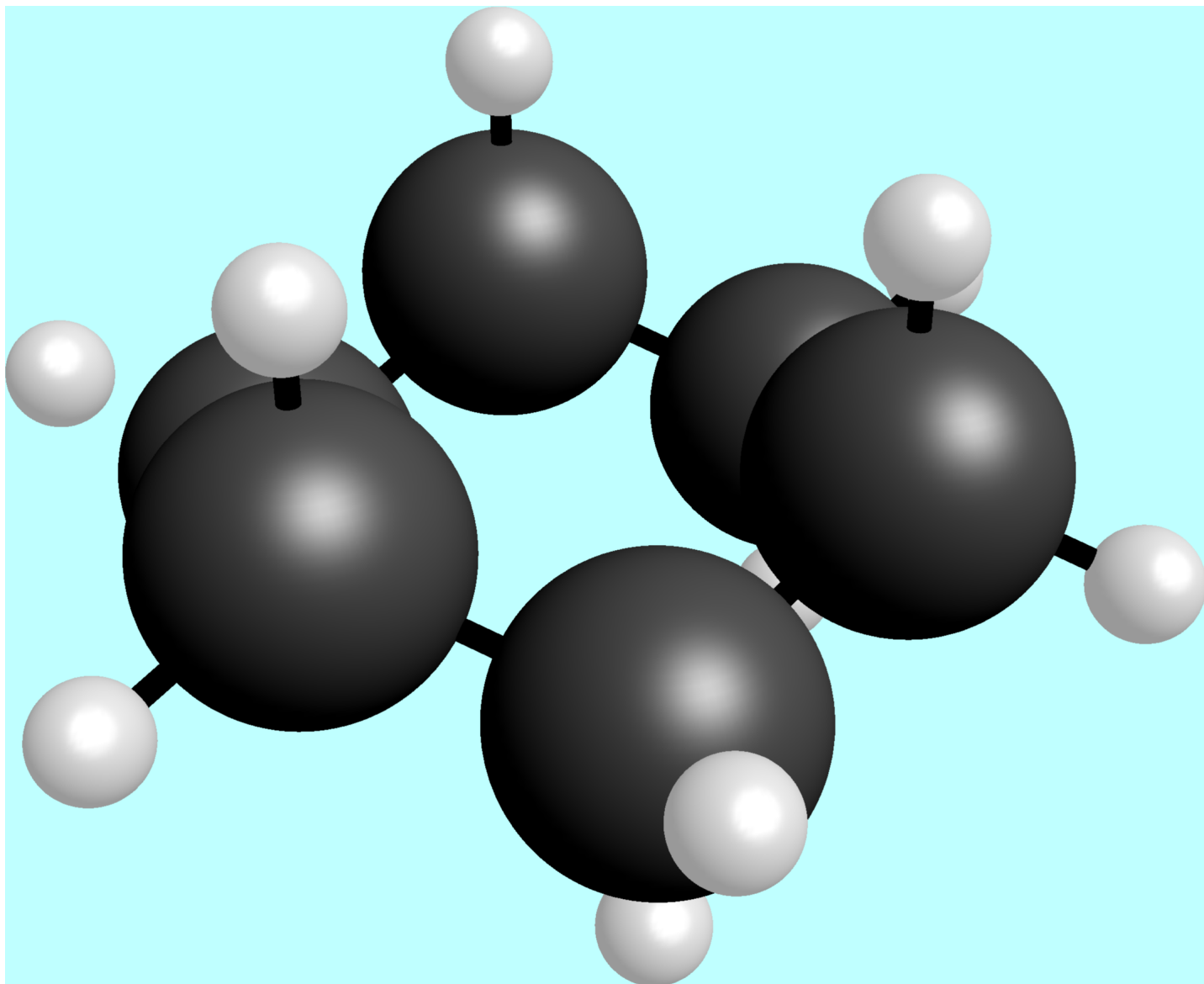


Рис. 2.2: 3-й скрипт

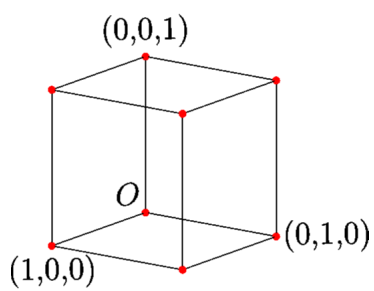
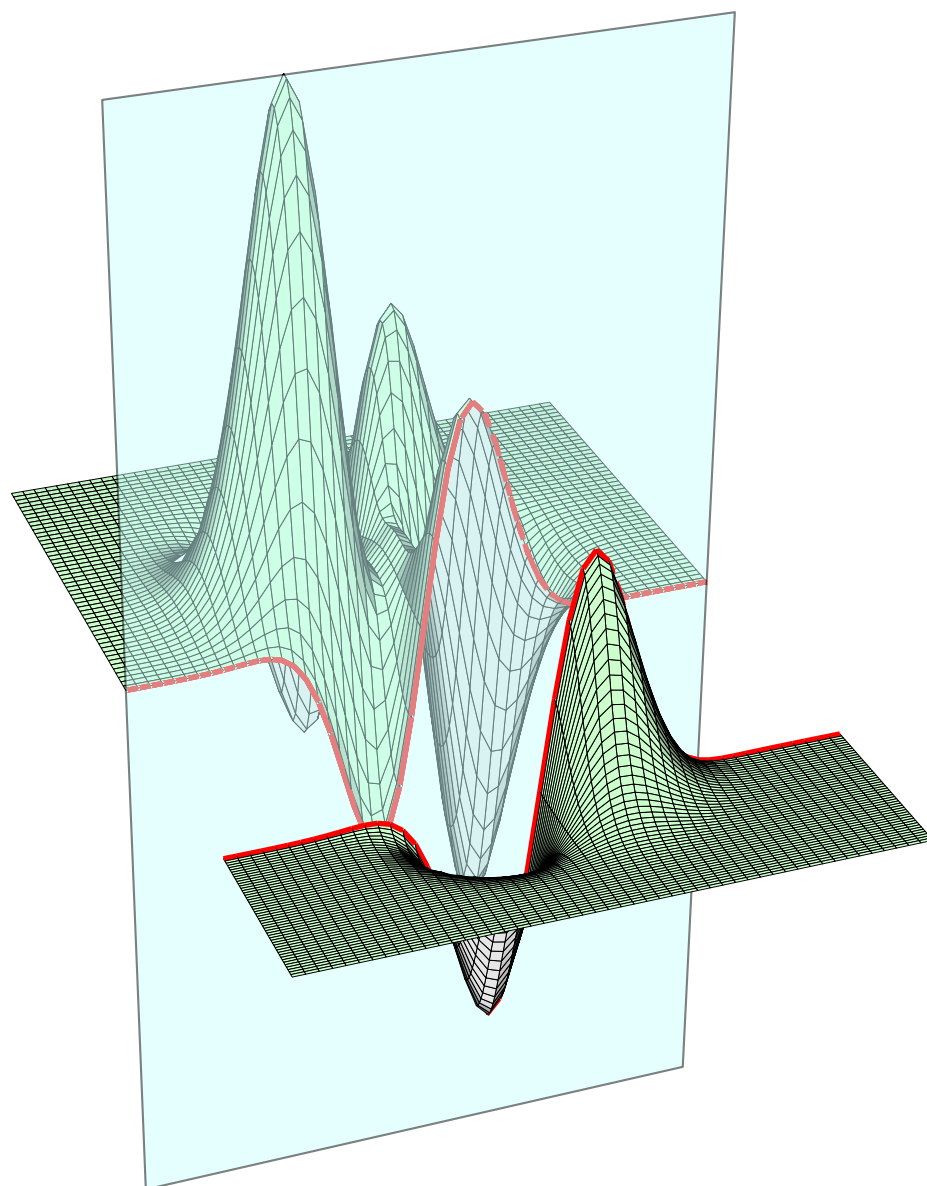


Рис. 2.3: Трёхмерный чертеж



Глава 3

Вывод

Картинки можно рисовать словами[1] [2]!

Литература

- [1] *Hobby, John D.* МЕТАPOST - РУКОВОДСТВО ПОЛЬЗОВАТЕЛЯ / John D. Hobby.
- [2] *Heck, Andre.* Learning METAPOST by Doing / Andre Heck.