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Практическое знакомство с графическими дополнениями LaTeX(MetaPost, PSTricks)

ОТЧЕТ
по лабораторной работе № 4

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Глава 1

Качественное решение ДУ. Поле направлений

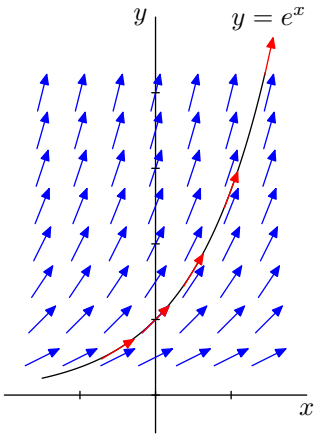


Рис. 1.1: 1-й скрипт

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;
```

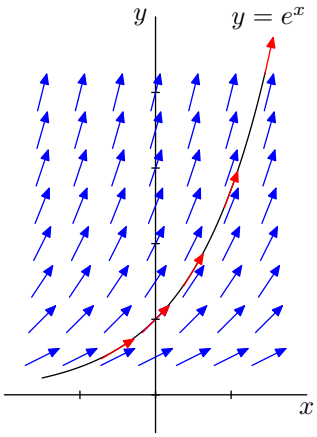


Рис. 1.2: Переписанный 1-ый скрипт

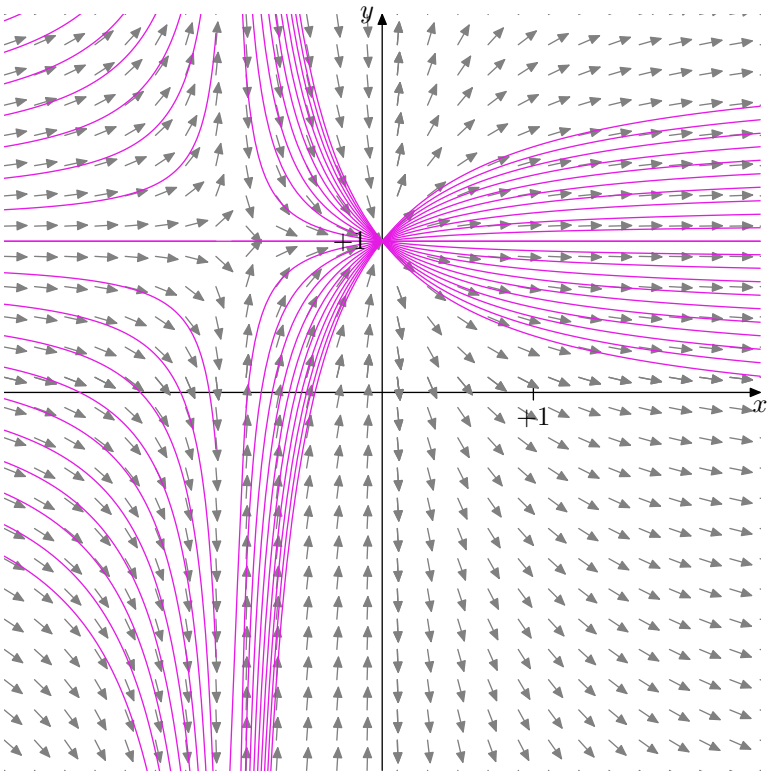
Переписанный 1-ый скрипт

```
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
%&latex
```

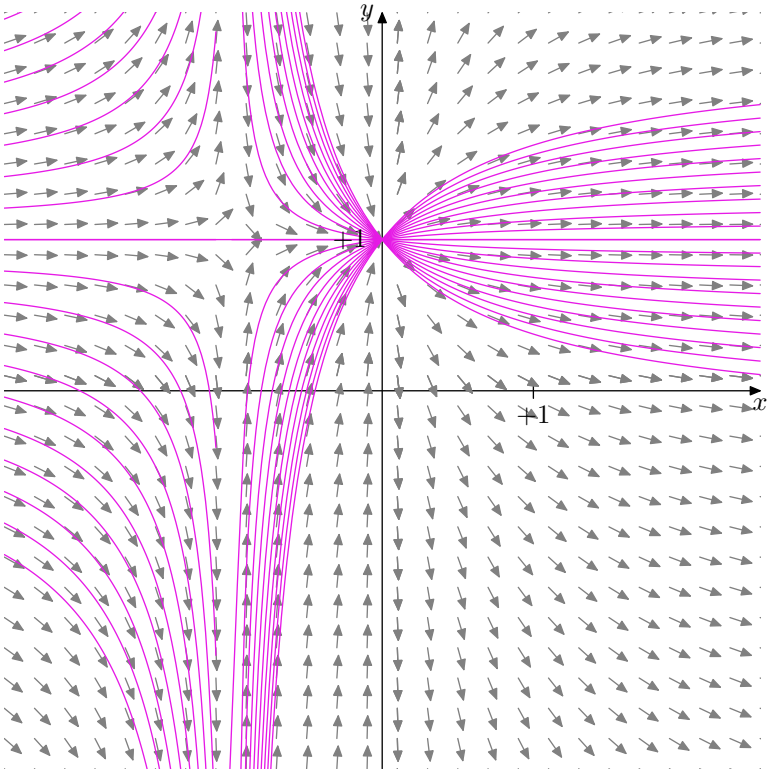


$$(x + x^2)y' - y = -1$$

Рис. 1.3: 2-й скрипт

```
\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 intgrales
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
```

```
%&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 intgrales
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

Вывод

Картинки можно рисовать словами[1]!

Литература

[1] *Hobby, John D.* METAPOST - РУКОВОДСТВО ПОЛЬЗОВАТЕЛЯ / John D. Hobby.