Московский Авиационный институт
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Институт №8
«Информационные технологии и прикладная математика»

Кафедра 813
«Компьютерная математика»

Курсовая работа по дисциплине «Теория графов»
Тема: «Применение фундаментальных алгоритмов для анализа данных»

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Содержание

1 First Section

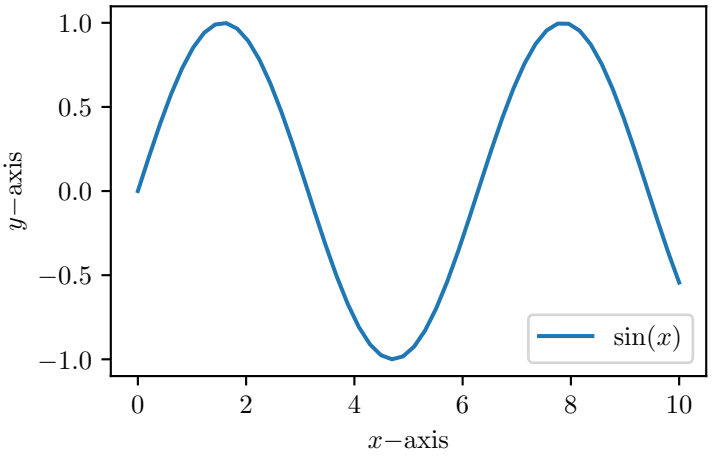
This document is an example of `natbib` package using in bibliography management. Three items are cited: *The LaTeX Companion* book [2], the Einstein journal paper Einstein [1], and the Donald Knuth's website [3]. The LaTeX related items are [2, 3].

```
import numpy as np

def incmatrix(genl1,genl2):
  m = len(genl1)
  n = len(genl2)
  M = None #to become the incidence matrix
  VT = np.zeros((n*m,1), int)  #dummy variable

  #compute the bitwise xor matrix
  M1 = bitxormatrix(genl1)
  M2 = np.triu(bitxormatrix(genl2),1)

  for i in range(m-1):
    for j in range(i+1, m):
      [r,c] = np.where(M2 == M1[i,j])
      for k in range(len(r)):
        VT[(i)*n + r[k]] = 1;
        VT[(i)*n + c[k]] = 1;
        VT[(j)*n + r[k]] = 1;
        VT[(j)*n + c[k]] = 1;

  if M is None:
    M = np.copy(VT)
  else:
    M = np.concatenate((M, VT), 1)

  VT = np.zeros((n*m,1), int)

  return M
```

Листинг 1: Python example

```
rc('text', usetex=True)
rc('font', family='serif')
rc('font', size=10.0)
rc('legend', fontsize=10.0)
rc('font', weight='normal')
x = linspace(0, 10)
figure(figsize=(4, 2.5))
plot(x, sin(x), label='$\sin(x)$')
```

```
xlabel(r'$x\mathrm{-axis}$')
ylabel(r'$y\mathrm{-axis}$')
legend(loc='lower right')
savefig('myplot.pdf', bbox_inches='tight')
```




```
from scipy.integrate import quad
myintegral = quad(lambda x: e**-x**2, 0, inf)[0]
```

$$\int_0^\infty e^{-x^2}\,dx = 0.886226925452758$$

2 An automated derivative and integral table

An Automated Derivative and Integral Table

```
from re import sub

var('x')

# Create a list of functions to include in the table
funcs = ['sin(x)', 'cos(x)', 'tan(x)',
'sin(x)**2', 'cos(x)**2', 'tan(x)**2',
'asin(x)', 'acos(x)', 'atan(x)',
'sinh(x)', 'cosh(x)', 'tanh(x)']

print(r'\begin{align*}')

for func in funcs:
```

```
        # Put in some vertical space when switching to arc and hyperbolic funcs
        if func == 'asin(x)' or func == 'sinh(x)':
            print(r'&\\')
        myderiv = 'Derivative(' + func + ', x)'
        myint = 'Integral(' + func + ', x)'
        print(latex(eval(myderiv)) + '&=' +
        latex(eval(myderiv + '.doit()')) + r'\quad & \quad')
        print(latex(eval(myint)) + '&=' +
        latex(eval(myint+'.doit()')) + r'\\')
        print(r'\end{align*}')
    print(r'\end{align*}')
```

$$\frac{d}{dx}\sin\left(x\right) = \cos\left(x\right) \qquad \int \sin\left(x\right) dx = -\cos\left(x\right)$$

$$\frac{\mathrm{d}}{dx}\cos\left(x\right)=-\sin\left(x\right) \qquad \int \cos\left(x\right) dx=\sin\left(x\right)$$

$$\frac{\mathrm{d}}{dx}\tan\left(x\right)=\tan^2\left(x\right)+1 \qquad \int \tan\left(x\right) dx=-\log\left(\cos\left(x\right)\right)$$

$$\frac{\mathrm{d}}{dx}\sin^2\left(x\right)=2\sin\left(x\right)\cos\left(x\right) \qquad \int \sin^2\left(x\right) dx=\frac{x}{2}-\frac{\sin\left(x\right)\cos\left(x\right)}{2}$$

$$\frac{\mathrm{d}}{dx}\cos^2\left(x\right)=-2\sin\left(x\right)\cos\left(x\right) \qquad \int \cos^2\left(x\right) dx=\frac{x}{2}+\frac{\sin\left(x\right)\cos\left(x\right)}{2}$$

$$\frac{\mathrm{d}}{dx}\tan^2\left(x\right)=\left(2\tan^2\left(x\right)+2\right)\tan\left(x\right) \qquad \int \tan^2\left(x\right) dx=-x+\frac{\sin\left(x\right)}{\cos\left(x\right)}$$

$$\frac{\mathrm{d}}{dx}\operatorname{asin}\left(x\right)=\frac{1}{\sqrt{1-x^2}} \qquad \int \operatorname{asin}\left(x\right) dx=x\operatorname{asin}\left(x\right)+\sqrt{1-x^2}$$

$$\mathrm{d}\frac{}{dx\,\operatorname{acos}(x)=-\frac{1}{\sqrt{1-x^2}}}\qquad\frac{}{\int\operatorname{acos}(x)\,dx=x\operatorname{acos}(x)-\sqrt{1-x^2}}$$

$$\mathrm{d}\frac{}{dx\,\operatorname{atan}(x)=\frac{1}{x^2+1}}\qquad\frac{}{\int\operatorname{atan}(x)\,dx=x\operatorname{atan}(x)-\frac{\log\left(x^2+1\right)}{2}}$$

$$\mathrm{d}\frac{}{dx\sinh(x)=\cosh(x)}\qquad\frac{}{\int\sinh(x)\,dx=\cosh(x)}$$

$$\mathrm{d}\frac{}{dx\cosh(x)=\sinh(x)}\qquad\frac{}{\int\cosh(x)\,dx=\sinh(x)}$$

$$\mathrm{d}\frac{}{dx\tanh(x)=1-\tanh^2(x)}\qquad\frac{}{\int\tanh(x)\,dx=x-\log(\tanh(x)+1)}$$

Список литературы

[1] A. Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905. doi: http://dx.doi.org/10.1002/andp.19053221004.

[2] M. Goossens, F. Mittelbach, and A. Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[3] D. Knuth. Knuth: Computers and typesetting. URL `http://www-cs-faculty.stanford.edu/~uno/abcde.html`.