In[∘]:=

```
points = {{-1, 3}, {0, 0.5}, {0.5, 0}, {1, 1}};

langrangePoly = InterpolatingPolynomial[points, x]
```

插值多项式

Out[∘]=

```
3 + (1 + x) (-1 + (-1 + x) (1.5 + 1. x))
```

In[∘]:=

```
f25 = langrangePoly /. x → 0.25
```

Out[∘]=

```
0.109375
```

In[∘]:=

```
f75 = langrangePoly /. x → 0 / 75
```

Out[∘]=

```
0.5
```

In[∘]:=

```
points = {{-1, 1.5}, {0, 0}, {0.5, 0}, {1, 0.5}};
langrangePoly = InterpolatingPolynomial[points, x];
f25 = langrangePoly /. x → -0.25;
f25' = langrangePoly /. x → 0.25;
{langrangePoly, f25, f25'}
```

插值多项式

Out[∘]=

```
{1.5 + (-0.5 + 1. (-1 + x)) (1 + x), 0.1875, -0.0625}
```

In[∘]:=

```
? Fit
```

Out[∘]=

Symbol

Fit[*data*, {f_1, …, f_n}, {*x*, *y*, …}] 求变量{*x*, *y*, …} 的函数 f_1, …, f_n 的 *data* 列表拟合 $a_1 f_1 + \ldots + a_n f_n$.

Fit[{*m*, *v*}] 求最小化设计矩阵 *m* 的 || m.a – v || 的拟合向量 *a*.

Fit[…, "*prop*"] 指定应返回哪些拟合属性 *prop*.

Documentation Web »

Options {FitRegularization → None, NormFunction → Automatic, WorkingPrecision → Automatic}

Attributes {Protected}

Full Name System`Fit

In[ ]:=

```
data =
  {{-1.00, 0.22}, {-0.50, 0.80}, {0, 2.0}, {0.25, 2.5}, {0.75, 3.8}, {1.00, 4.2}};

linearFit = Fit[data, {1, x}, x]
            拟合

quadraticFit = Fit[data, {1, x, x^2}, x]
               拟合

ListPlot[data, PlotStyle → Red, PlotLabel → "Data Points",
绘制点集         绘图样式      红色   绘图标签
 AxesLabel → {"Xi", "yi"}, PlotRange → All]
 坐标轴标签                 绘制范围      全部
Show[Plot[linearFit, {x, -1.1, 1.1}, PlotStyle → Blue, PlotLabel → "Linear Fit"],
显示  绘图                           绘图样式      蓝色   绘图标签          拟合
 Plot[quadraticFit, {x, -1.1, 1.1}, PlotStyle → Green, PlotLabel → "Quadratic Fit"],
 绘图                               绘图样式      绿色    绘图标签            拟合
 ListPlot[data, PlotStyle → Red, PlotMarkers → Automatic],
 绘制点集         绘图样式      红色  绘制点的标记    自动
 PlotRange → All, AxesLabel → {"Xi", "yi"}]
 绘制范围     全部  坐标轴标签
```

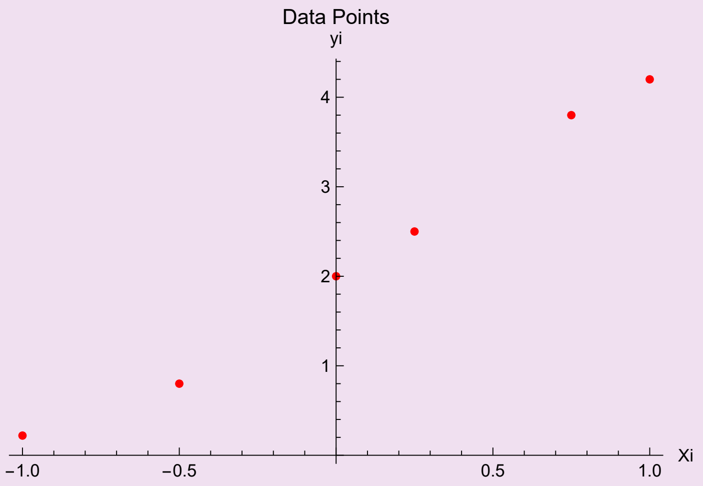
Out[ ]=

$2.07897 + 2.09235\,x$

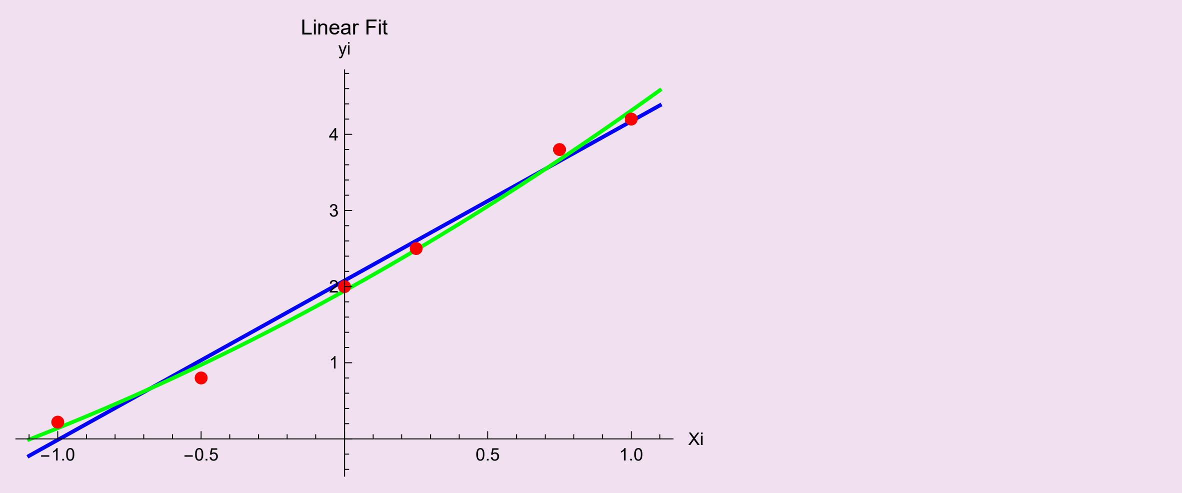
Out[ ]=

$1.94449 + 2.0851\,x + 0.28191\,x^2$

Out[ ]=



Out[•]=



In[•]:=

```
points = {{19, 19.00}, {23, 28.50}, {30, 47.00}, {35, 68.20}, {40, 90.00}};
fit = Fit[points, {1, x^2}, x]
      拟合
```

Out[•]=

$-2.37227 + 0.0573264\, x^2$

In[•]:=

```
points = {{0, 2.00}, {1, 2.50}, {2, 4.00}, {3, 6.00}, {4, 8.00}};

fitParams = FindFit[points, a * Exp[b * x], {a, b}, x]
            求拟合                指数形式
fit = a * Exp[b * x] /. fitParams
          指数形式
```

Out[•]=

$\{a \to 1.94454,\ b \to 0.358018\}$

Out[•]=

$1.94454\, e^{0.358018\, x}$

In[•]:=

```
c = {-3, -2};
m = {{1, -2}, {-3, -2}, {-1, 1}};
b = {-4, -14, -3};
l = {0, 0};
solution = LinearProgramming[c, m , b]
           线性规划
```

Out[•]=

{4, 1}

In[ ]:=
```
c = {2, 3, 4};
delta = 10^-5;
m = {{-1, -2, 1}, {-1, -1, 1}, {0, -1, -2}};
b = {10 + delta, 60, 12 + delta};
solution = LinearProgramming[c, -m, b, {delta, delta, 1 + delta}]
           线性规划
```

Out[ ]=

$$\left\{\frac{2550001}{50000}, \frac{999999}{100000}, \frac{100001}{100000}\right\}$$

```
(*We make some modifications:
   z' = z - 1, then z' > 0
   min m = 2x+3y+4z'+4
    x = x1-x2, y = y1-y2, z' = z1-z2*)
c = {2, -2, 3, -3, 4, -4, 0, 0};
m = {{1, -1, 2, -2, -1, 1, -1, 0},
   {1, -1, 1, -1, -1, 1, 0, 0}, {0, 0, 1, -1, 2, -2, 0, -1}};
b = {11, 61, 10};
solution = LinearProgramming[c, m, b]
           线性规划
```

LinearProgramming: 该问题是无界的.

Out[ ]=

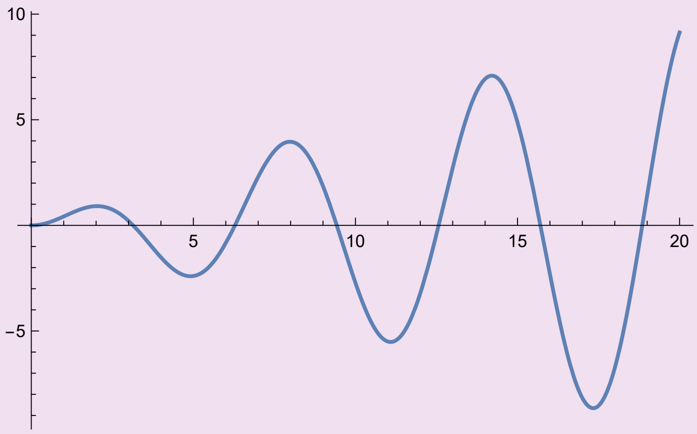
```
{Indeterminate, Indeterminate, Indeterminate, Indeterminate,
 Indeterminate, Indeterminate, Indeterminate, Indeterminate}
```

In[ ]:=
```
DSolve[{y''[x] + y[x] == Cos[x], y[0] == 0, y'[0] == 0}, y[x], x]
求解微分方程                    余弦
sol = y[x] /. First[%];
              第一个
Plot[sol, {x, 0, 20}]
绘图
```

Out[ ]=

$$\left\{\left\{y[x] \to \frac{1}{4}\left(-2\,\mathrm{Cos}[x] + 2\,\mathrm{Cos}[x]^3 + 2\,x\,\mathrm{Sin}[x] + \mathrm{Sin}[x]\,\mathrm{Sin}[2\,x]\right)\right\}\right\}$$

Out[ ]=



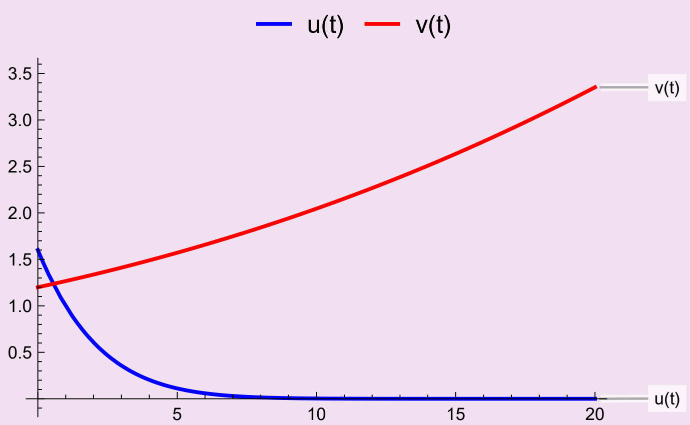
In[1]:=

```
Clear["Global`*"]
清除

solution = NDSolve[{u'[t] == 0.09 * u[t] * (1 - u[t]/20) - 0.45 * u[t] * v[t],
           数值求解微分方程组
    v'[t] == 0.06 * v[t] * (1 - v[t]/15) - 0.001 * u[t] * v[t],
    u[0] == 1.6, v[0] == 1.2}, {u, v}, {t, 20}]

Plot[Evaluate[{u[t], v[t]} /. solution], {t, 0, 20}, PlotLabels → {"u(t)", "v(t)"},
绘图  计算                                          数据绘制标签
 PlotLegends → Placed[{"u(t)", "v(t)"}, Above], PlotStyle → {Blue, Red}]
 绘图的图例     放置                         上      绘图样式        蓝色   红色
```

Out[2]=

```
{{u → InterpolatingFunction[ Domain: {{0., 20.}} Output: scalar ],
  v → InterpolatingFunction[ Domain: {{0., 20.}} Output: scalar ]}}
```

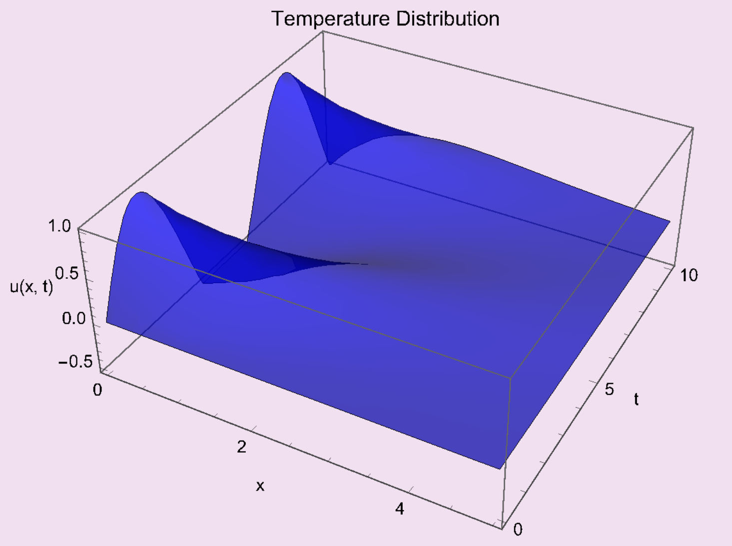
Out[3]=



In[∘]:=

```
heatEquation = D[u[x, t], t] == D[u[x, t], {x, 2}];
               偏导               偏导

initialCondition = u[x, 0] == 0;

boundaryConditions = {u[0, t] == Sin[t], u[5, t] == 0};
                                 正弦

solution = NDSolve[
           数值求解微分方程组
   {heatEquation, initialCondition, boundaryConditions}, u, {x, 0, 5}, {t, 0, 10}];

Plot3D[Evaluate[u[x, t] /. solution], {x, 0, 5}, {t, 0, 10},
绘制⋯  计算
 PlotLabel → "Temperature Distribution", AxesLabel → {"x", "t", "u(x, t)"},
 绘图标签                                  坐标轴标签
 Mesh → None, PlotStyle → Directive[Opacity[0.7], Blue]]
 网格    无     绘图样式      指令        不透明度        蓝色
```

Out[∘]=



In[63]:=

```
ClearAll[u, x, t]
清除全部

(*定义波动方程*) len = 10; (*定义计算区域的长度*)
pde = D[u[x, t], {t, 2}] == D[u[x, t], {x, 2}];
      偏导                    偏导

(*设置初始条件*)
ic = {u[x, 0] == Exp[-x^2], Derivative[0, 1][u][x, 0] == 0}; (*初始位移和速度*)
                 指数形式     导数

(*设置边界条件：周期性边界条件*)
bc = {u[-len, t] == u[len, t],
    Derivative[1, 0][u][-len, t] == Derivative[1, 0][u][len, t]};
    导数                          导数

(*使用 NDSolve 求解波动方程*)
       数值求解微分方程组
solution = NDSolve[{pde, ic[[1]], ic[[2]], bc[[1]], bc[[2]]}, u, {x, -len, len}, {t, 0, 40}]
           数值求解微分方程组
```

Out[68]=

```
{{u → InterpolatingFunction[ Domain: {{-10., 10.}, {0., 40.}}
                             Output: scalar ]}}
没有保存数据；立即保存
```

In[71]:=
```
(*可视化解*)uSolution[x_, t_] := u[x, t] /. solution⟦1⟧;
Plot3D[uSolution[x, t], {x, -len, len}, {t, 0, 40}, PlotRange → All,
 AxesLabel → {"x", "t", "u(x, t)"}, MeshFunctions → {#3 &}, Mesh → 10]
```
绘制三维图形 绘制范围 全部 坐标轴标签 网格函数 网格

Out[72]=