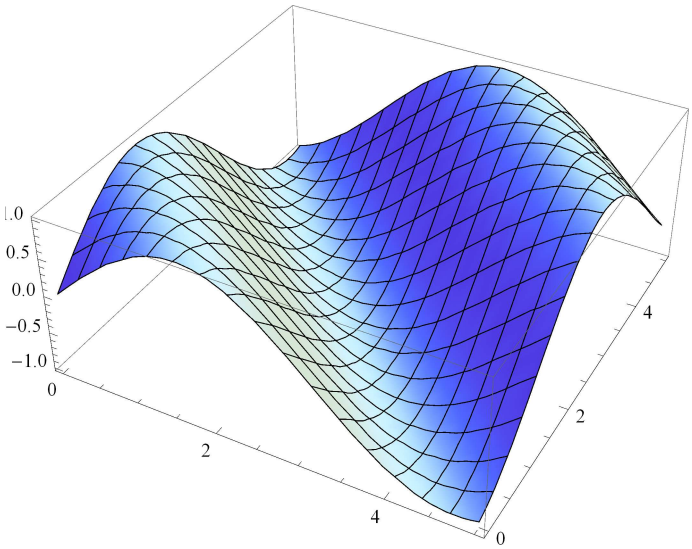
Grafy II

3 D grafy

Funkce Plot3D[funkce, {x, min, max}, {y, min, max}]

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}]
```



Možnosti nastavení 3 D grafů

```
Options[Plot3D]
```

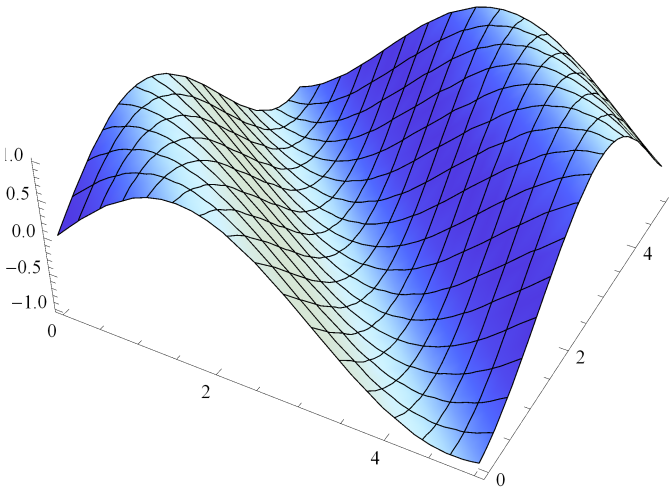
```
{AlignmentPoint → Center, AspectRatio → Automatic, Axes → True, AxesEdge → Automatic,
 AxesLabel → None, AxesOrigin → Automatic, AxesStyle → {}, Background → None,
 BaselinePosition → Automatic, BaseStyle → {}, BoundaryStyle → GrayLevel[0],
 Boxed → True, BoxRatios → {1, 1, 0.4}, BoxStyle → {}, ClippingStyle → Automatic,
 ColorFunction → Automatic, ColorFunctionScaling → True, ColorOutput → Automatic,
 ContentSelectable → Automatic, ControllerLinking → Automatic,
 ControllerMethod → Automatic, ControllerPath → Automatic,
 CoordinatesToolOptions → Automatic, DisplayFunction :→ $DisplayFunction,
 Epilog → {}, Evaluated → Automatic, EvaluationMonitor → None, Exclusions → Automatic,
 ExclusionsStyle → None, FaceGrids → None, FaceGridsStyle → {}, Filling → None,
 FillingStyle → Opacity[0.5], FormatType :→ TraditionalForm, ImageMargins → 0.,
 ImagePadding → All, ImageSize → Automatic, LabelStyle → {}, Lighting → Automatic,
 MaxRecursion → Automatic, Mesh → Automatic, MeshFunctions → {#1 &, #2 &},
 MeshShading → None, MeshStyle → Automatic, Method → Automatic,
 NormalsFunction → Automatic, PerformanceGoal :→ $PerformanceGoal, PlotLabel → None,
 PlotPoints → Automatic, PlotRange → {Full, Full, Automatic}, PlotRangePadding → Automatic,
 PlotRegion → Automatic, PlotStyle → Automatic, PreserveImageOptions → Automatic,
 Prolog → {}, RegionFunction → (True &), RotationAction → Fit, SphericalRegion → False,
 Ticks → Automatic, TicksStyle → {}, ViewAngle → Automatic, ViewCenter → Automatic,
 ViewMatrix → Automatic, ViewPoint → {1.3, -2.4, 2.}, ViewRange → All,
 ViewVector → Automatic, ViewVertical → {0, 0, 1}, WorkingPrecision → MachinePrecision}
```

Boxed

zobrazení kvádru nebo krychle kolem vykreslované plochy

hodnoty : True, False

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, Boxed → False]
```



ViewPoint

Nastavení bodu pohledu na graf

Výchozí : {1.3, -2.4, 2}

Zepředu , zvrchu : {0, -2, 2}

Zleva : {-2, -2, 0}

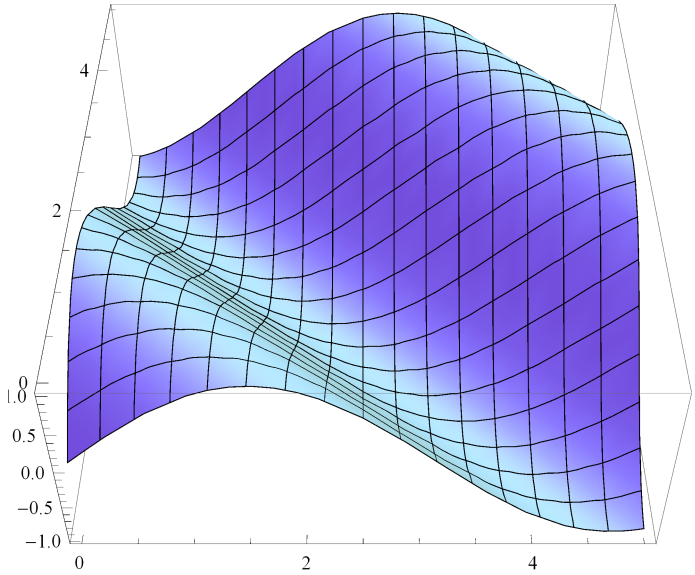
Zepředu, zespodu : {0, -2, -2}

Zepředu : {0, -2, 0}

Zhora : {0, 0, 2}

Zprava : {2, -2, 0}

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, ViewPoint → {0, -2, 2}]
```

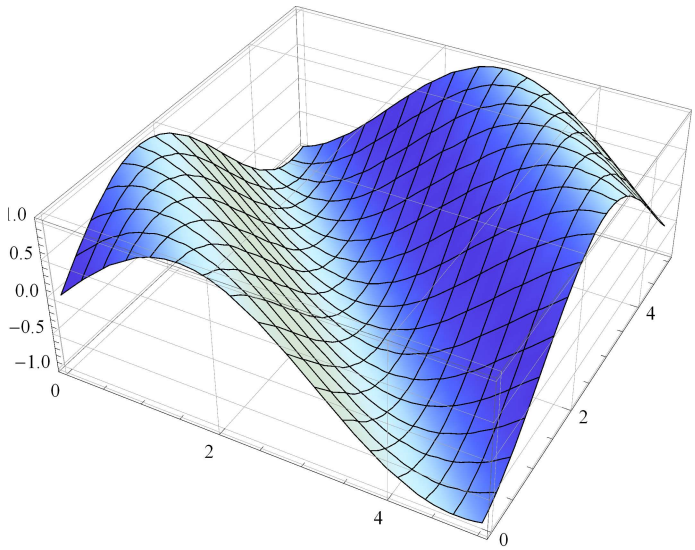


■ FaceGrids

vykreslení 3D sítě kolem grafu

hodnoty : None, All

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, FaceGrids → All]
```

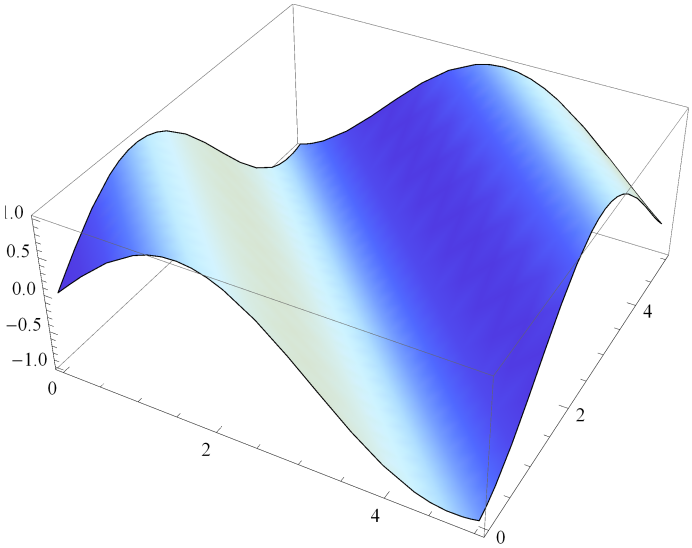


■ Mesh

vykreslení sítě na vykreslované ploše grafu

hodnoty : True, False

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, Mesh → False]
```

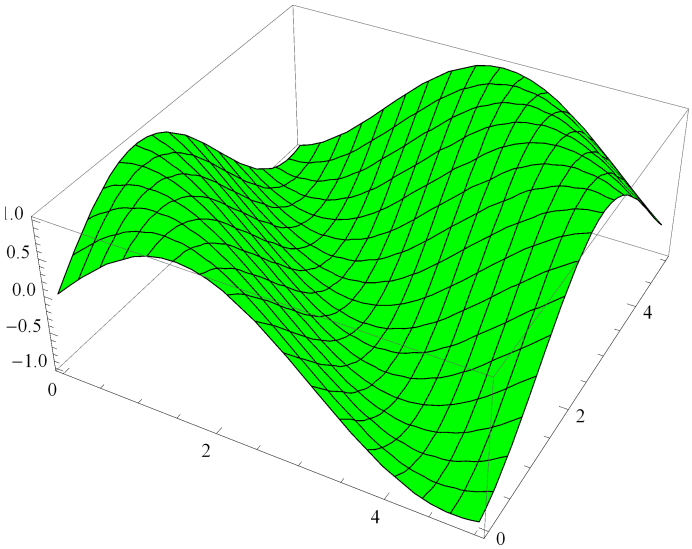


■ Lighting

parametr pro využití simulovaného světla

hodnoty : None, Automatic, barva

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, Lighting → {Green}]
```

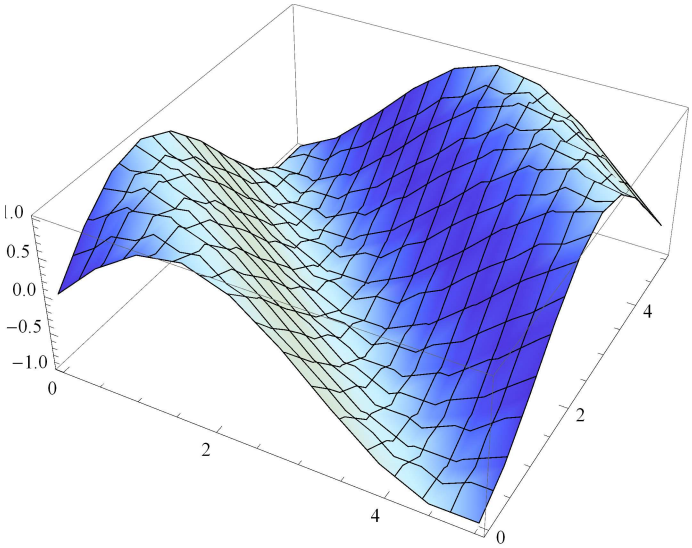


■ PlotPoints

počet vykreslovaných bodů, hustota sítě

hodnoty : 15, n, {nx,ny}

```
Plot3D[Sin[x + y], {x, 0, 5}, {y, 0, 5}, PlotPoints → 10, MaxRecursion → 0]
```



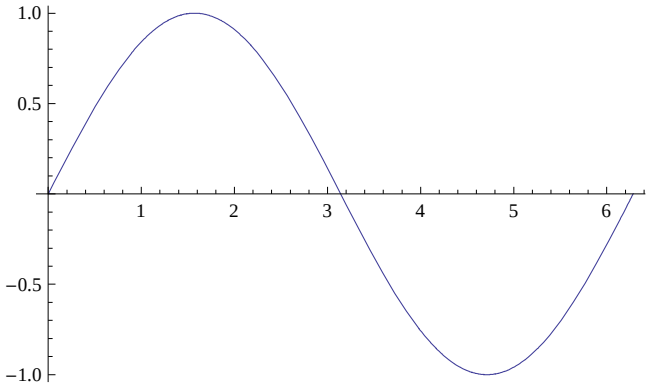
Vykreslení grafů - funkce Show

Znovu vykreslení uloženého grafu

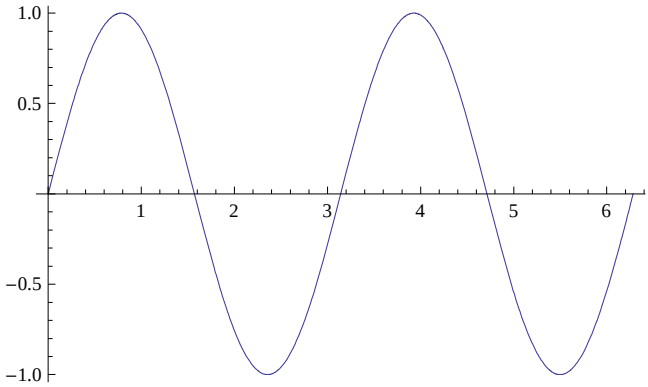
Může obsahovat parametry pro zobrazení grafu, stejně jako Plot nebo Plot3D

Show[graf]

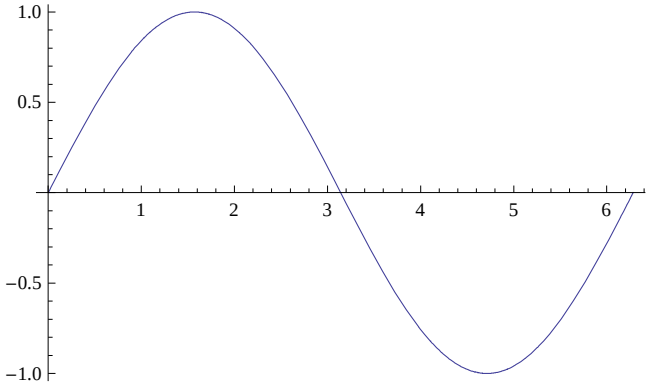
```
graf1 = Plot[Sin[x], {x, 0, 2 π}]
```



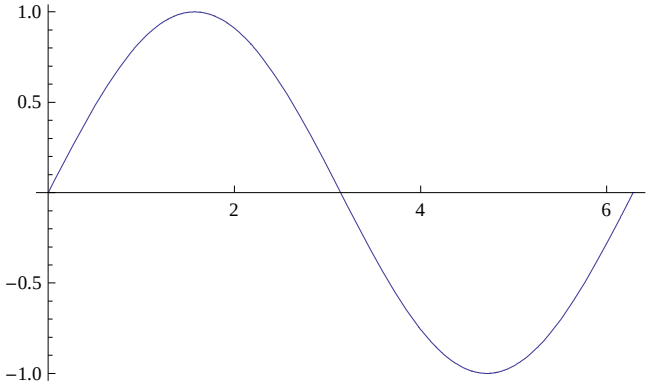

```
graf2 = Plot[Sin[2 x], {x, 0, 2 π}]
```



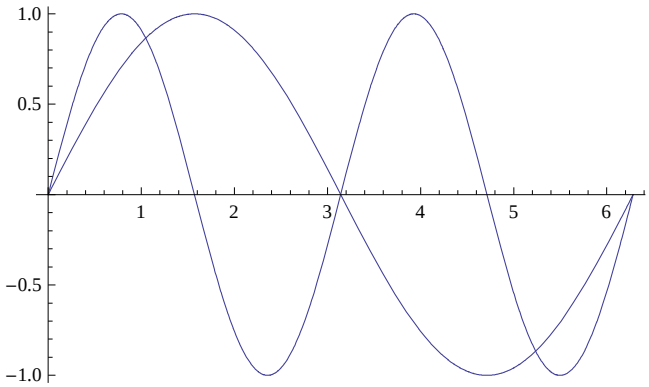
```
Show[graf1]
```



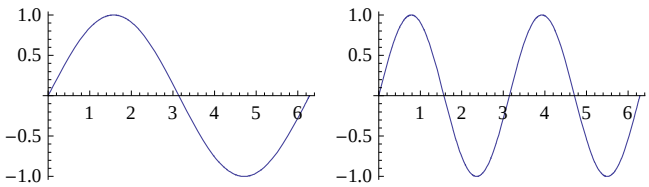

```
Show[graf1, Ticks → {{2, 4, 6}, Automatic}]
```



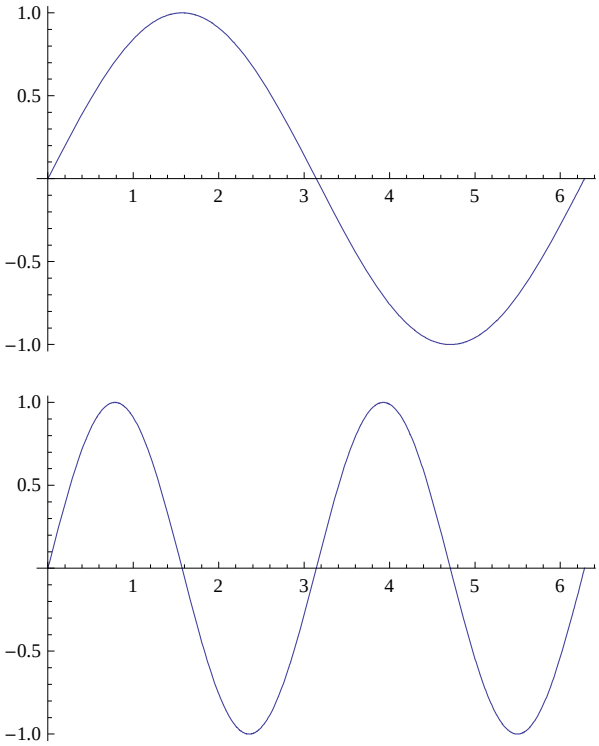

```
Show[{graf1, graf2}]
```




```
Show[GraphicsArray[{graf1, graf2}]]
```



```
Show[GraphicsArray[{{graf1}, {graf2}}]]
```



Animace grafů

```
Animate[Plot[Sin[i * x], {x, 0, 2 π}], {i, 0.1, 5, 0.1}, AnimationRunning → False]
```

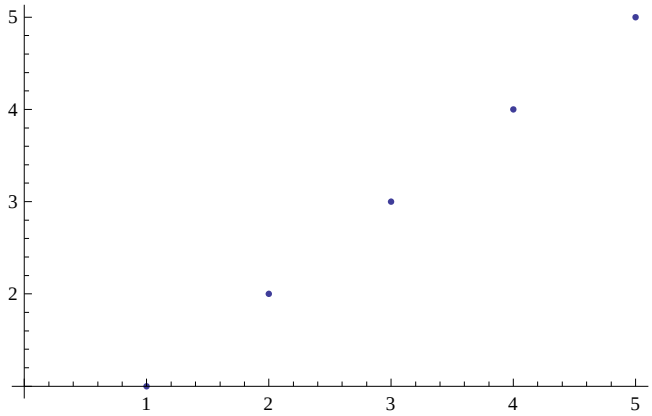
Bodový graf - ListPlot

Vykreslení bodového grafu - na vstupu je vektor s vykreslovanými body

ListPlot[{y1, y2, ...}]

ListPlot[{{x1, y1}, {x2, y2}, ...}]

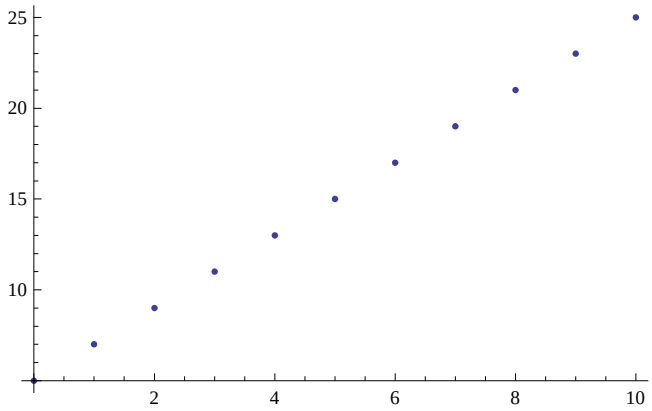
```
ListPlot[{1, 2, 3, 4, 5}]
```




```
body = Table[{x, 2 x + 5}, {x, 0, 10}]
```

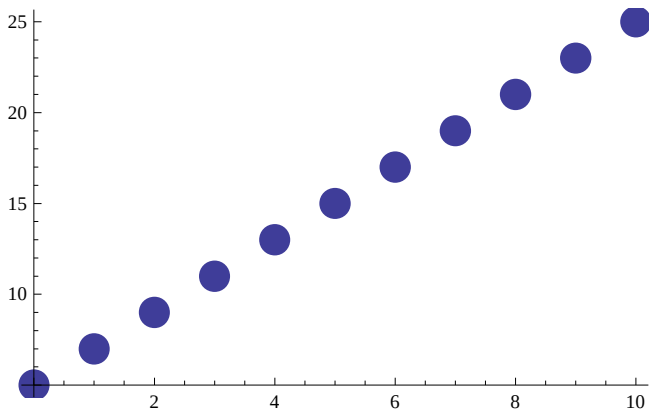
```
{{0, 5}, {1, 7}, {2, 9}, {3, 11}, {4, 13},
 {5, 15}, {6, 17}, {7, 19}, {8, 21}, {9, 23}, {10, 25}}
```

```
ListPlot[body]
```



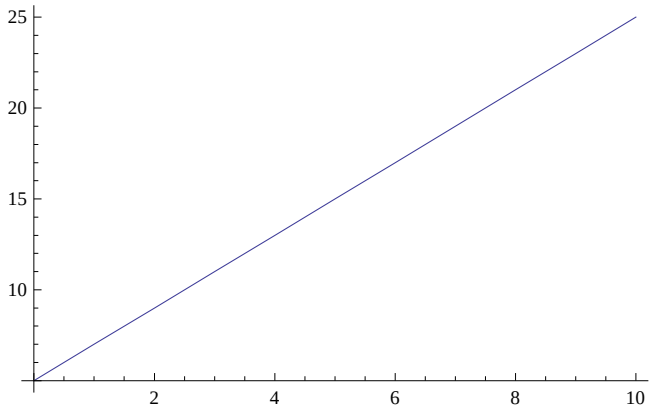
- **PointSize ... Nastavení velikosti vykreslovaných bodů**

```
ListPlot[body, PlotStyle → PointSize[0.05]]
```



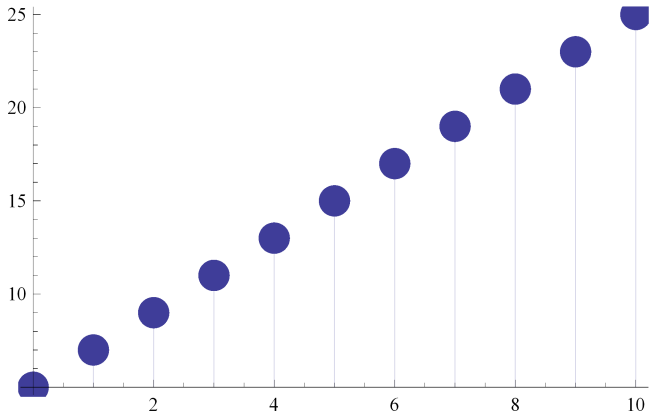
- **Joined ... Propojení vykreslovaných bodů čarou**

```
ListPlot[body, PlotStyle → PointSize[0.05], Joined → True]
```



- **Filling ... Výplň, pod daným bodem**

```
ListPlot[body, PlotStyle → PointSize[0.05], Filling → Axis]
```

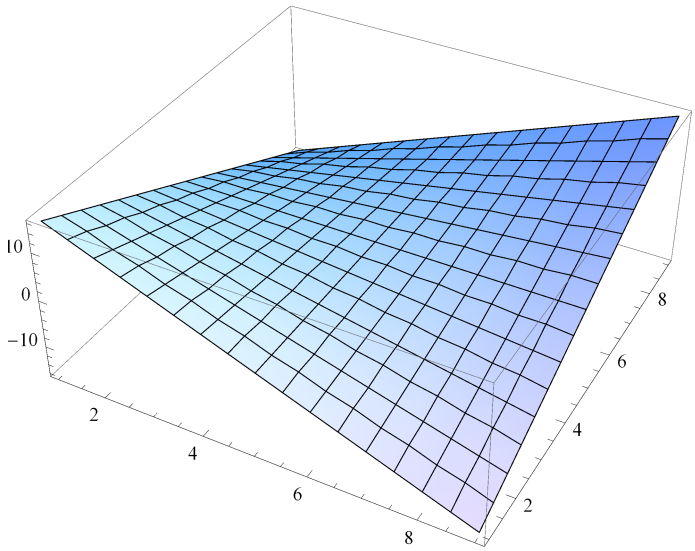


- **ListPlot3D - 3 D bodový graf**

```
body3D = Table[x * y, {x, -4, 4}, {y, -4, 4}]
```

```
{{16, 12, 8, 4, 0, -4, -8, -12, -16}, {12, 9, 6, 3, 0, -3, -6, -9, -12},
 {8, 6, 4, 2, 0, -2, -4, -6, -8}, {4, 3, 2, 1, 0, -1, -2, -3, -4},
 {0, 0, 0, 0, 0, 0, 0, 0, 0}, {-4, -3, -2, -1, 0, 1, 2, 3, 4}, {-8, -6, -4, -2, 0, 2, 4, 6, 8},
 {-12, -9, -6, -3, 0, 3, 6, 9, 12}, {-16, -12, -8, -4, 0, 4, 8, 12, 16}}
```

```
ListPlot3D[body3D]
```

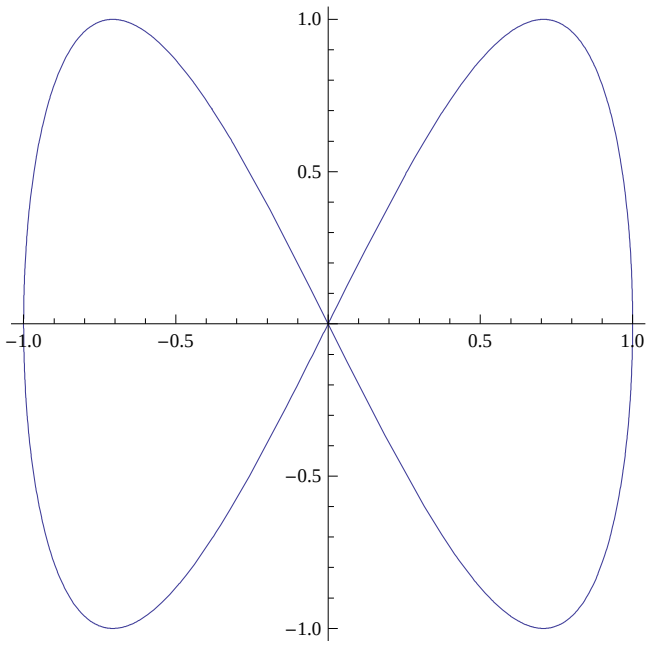


Parametrický graf - ParametricPlot

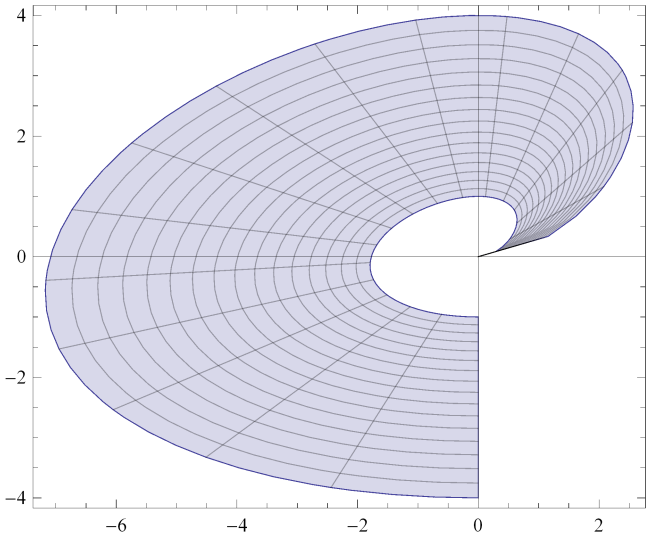
Hodnoty x a y získáme jako funkce parametru u

ParametricPlot[{fx, fy}, {u, umin, umax}]

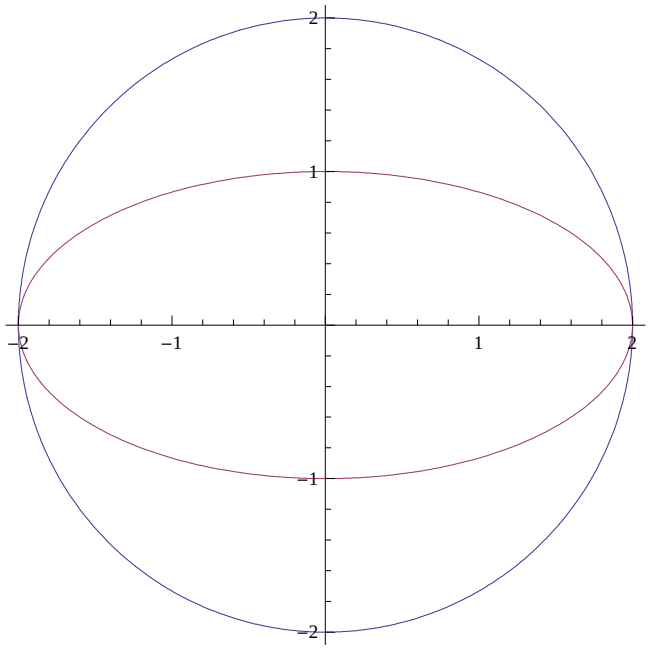
```
ParametricPlot[{Sin[u], Sin[2 u]}, {u, 0, 2 Pi}]
```



```
ParametricPlot[r^2 {Sqrt[t] Cos[t], Sin[t]}, {t, 0, 3 Pi / 2}, {r, 1, 2}]
```




```
ParametricPlot[{{2 Cos[t], 2 Sin[t]}, {2 Cos[t], Sin[t]}}, {t, 0, 2 Pi}]
```

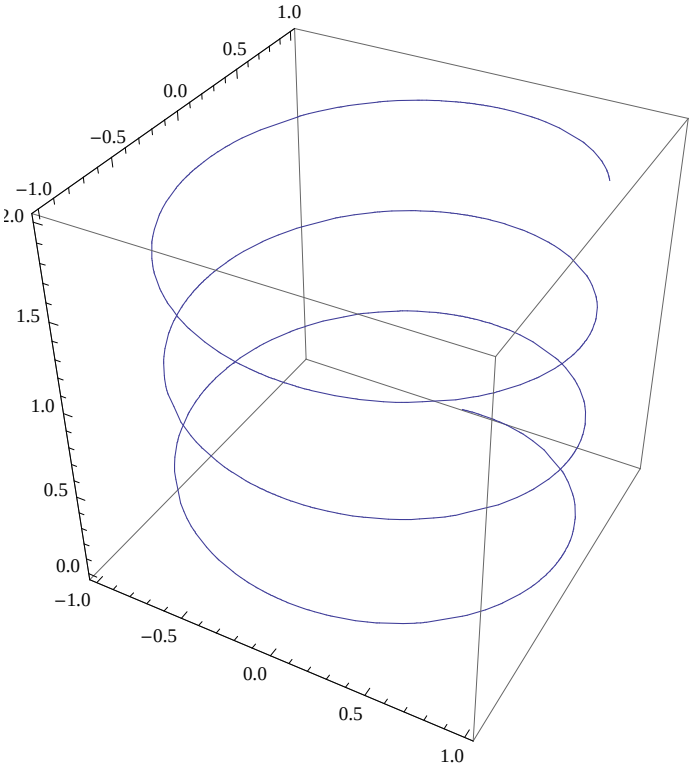


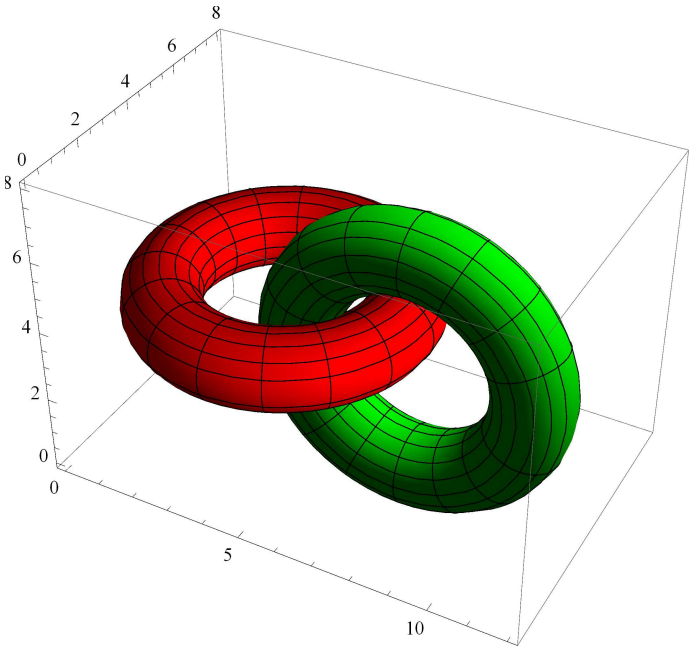
3D Parametrický graf - ParametricPlot3D

Hodnoty x, y a z získáme jako funkce parametru u

ParametricPlot3D[{fx, fy,fz}, {u, umin, umax}]

```
ParametricPlot3D[{Sin[u], Cos[u], u / 10}, {u, 0, 20}]
```




```
ParametricPlot3D[{{4 + (3 + Cos[v]) Sin[u], 4 + (3 + Cos[v]) Cos[u], 4 + Sin[v]},
  {8 + (3 + Cos[v]) Cos[u], 3 + Sin[v], 4 + (3 + Cos[v]) Sin[u]}},
 {u, 0, 2 Pi}, {v, 0, 2 Pi}, PlotStyle → {Red, Green}]
```