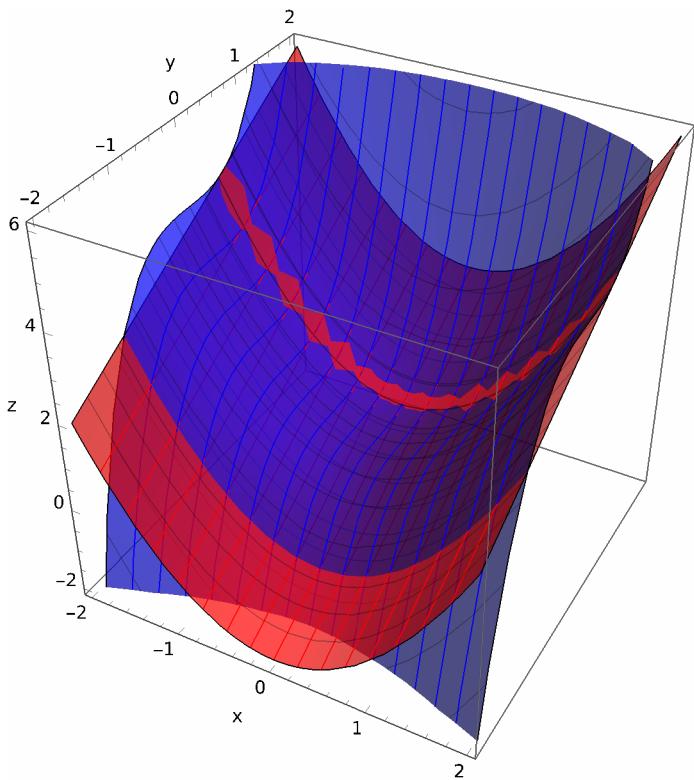


```
In[10]:= Show[
  Plot3D[x^2 + y, {x, -2, 2}, {y, -2, 2},
  PlotStyle -> Directive[Opacity[0.7], Red],
  MeshStyle -> {Red, Opacity[0.3]}],
  Plot3D[x^2 + y^3 + 0.37, {x, -2, 2}, {y, -2, 2},
  PlotStyle -> Directive[Opacity[0.7], Blue],
  MeshStyle -> {Blue, Opacity[0.3]}],
  AxesLabel -> {"x", "y", "z"},
  BoxRatios -> {1, 1, 1}
]
```

Out[10]=



```
In[12]:= Manipulate[
  Show[
    Plot3D[x^2 + y, {x, -2, 2}, {y, -2, 2},
    PlotStyle -> Directive[Opacity[0.7], Red],
    MeshStyle -> {Red, Opacity[0.3]},
    PerformanceGoal -> "Quality"],
    Plot3D[x^2 + y^3 + 0.37, {x, -2, 2}, {y, -2, 2},
```

```

PlotStyle -> Directive[Opacity[0.7], Blue],
MeshStyle -> {Blue, Opacity[0.3]},
PerformanceGoal -> "Quality"],

Plot3D[
x0^2 + y0 + 2*x0*(x - x0) + 1*(y - y0),
{x, x0 - 1, x0 + 1}, {y, y0 - 1, y0 + 1},
PlotStyle -> Directive[Opacity[0.8], Green],
MeshStyle -> {Green, Opacity[0.5]},
PerformanceGoal -> "Quality"],

Plot3D[
x0^2 + y0^3 + 0.37 + 2*x0*(x - x0) + 3*y0^2*(y - y0),
{x, x0 - 1, x0 + 1}, {y, y0 - 1, y0 + 1},
PlotStyle -> Directive[Opacity[0.8], Orange],
MeshStyle -> {Orange, Opacity[0.5]},
PerformanceGoal -> "Quality"],

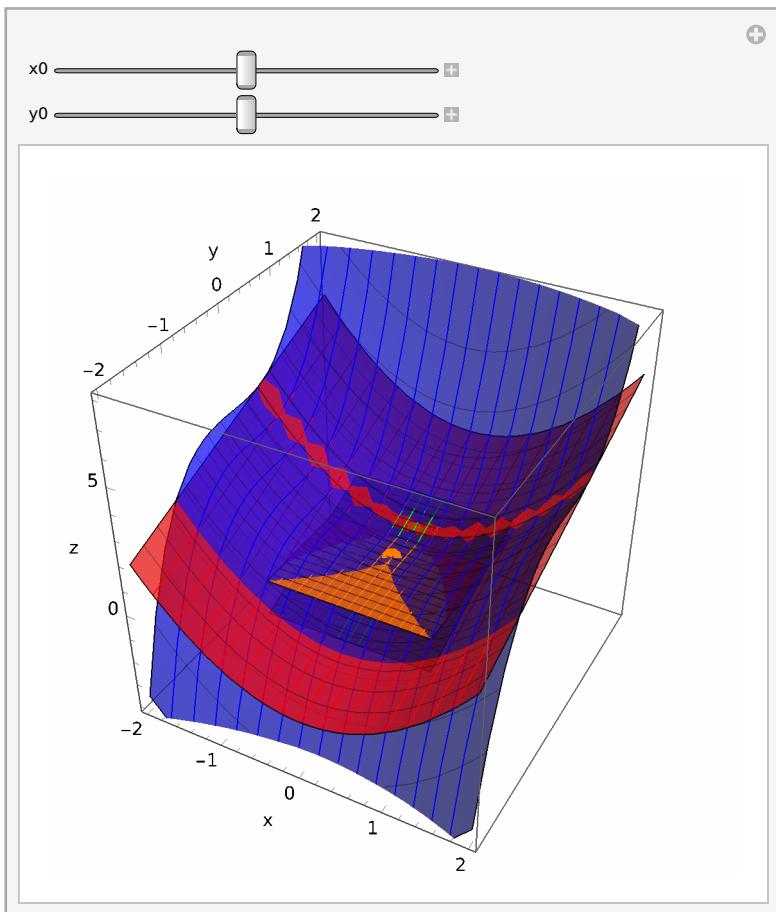
Graphics3D[{
PointSize[0.03], Green,
Point[{x0, y0, x0^2 + y0}],
PointSize[0.03], Orange,
Point[{x0, y0, x0^2 + y0^3 + 0.37}]
}],

AxesLabel -> {"x", "y", "z"},
BoxRatios -> {2, 2, 2},
PlotRange -> {{-2, 2}, {-2, 2}, {-4, 8}},
SphericalRegion -> True
],

{{x0, 0}, -1.5, 1.5, 0.1},
{{y0, 0}, -1.5, 1.5, 0.1}
]

```

Out[12]=



```
In[13]:= Manipulate[
Module[{f, x0, tanLine, plotRange},
f[x_] := Sin[x];
x0 = pt[[1]];

tanLine[x_] := f[x0] + f'[x0]*(x - x0);

plotRange = {{-2*Pi, 2*Pi}, {-2, 2}};

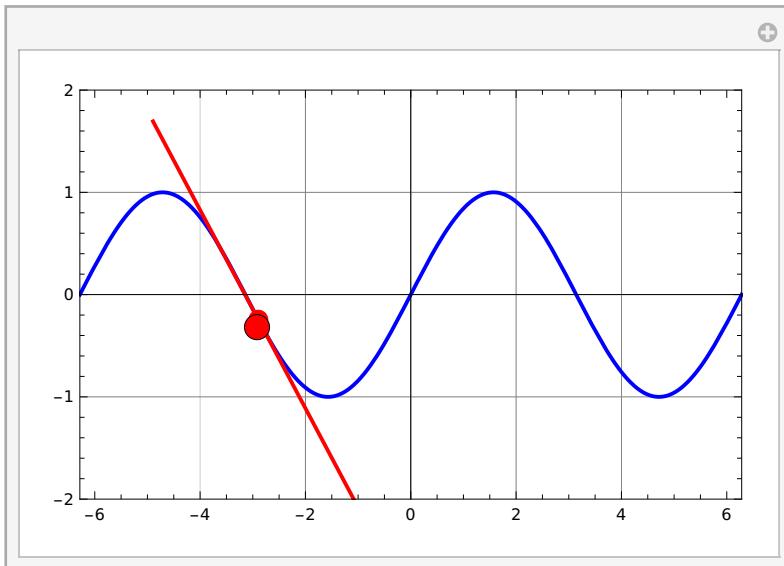
Show[
Plot[f[x], {x, -2*Pi, 2*Pi},
PlotStyle -> {Blue, Thick},
PlotRange -> plotRange,
GridLines -> Automatic,
Frame -> True,
Axes -> True],

Plot[tanLine[x], {x, x0 - 2, x0 + 2},
PlotStyle -> {Red, Thick},
PlotRange -> plotRange],

Graphics[
Red, PointSize[0.03],
Point[{x0, f[x0]}],
Black
}]
],
{pt, {0, 0}}, Locator,
Appearance -> Graphics[
Red, Disk[{0, 0}, 0.1],
Black, Circle[{0, 0}, 0.1]
}, ImageSize -> 15]],

TrackedSymbols -> {pt},
ControlPlacement -> Bottom
]
```

Out[13]=

In[14]:= (* Градиентный метод для $f(x, y) = x^2 + y^2$ с интерактивным выбором начальной точки *)

```

Manipulate[
Module[{f, grad, points, currentPoint, learningRate, maxIterations,
tolerance, i, gradient, newPoint},

f[x_, y_] := x^2 + y^2;
grad[x_, y_] := {2*x, 2*y};

learningRate = 0.1;
maxIterations = 50;
tolerance = 0.001;

currentPoint = startPoint;
points = {currentPoint};

For[i = 1, i <= maxIterations, i++,
gradient = grad[currentPoint[[1]], currentPoint[[2]]];
If[Norm[gradient] < tolerance, Break[]];

newPoint = currentPoint - learningRate * gradient;
currentPoint = newPoint;
points = Append[points, currentPoint];
];

Show[

```

```
ContourPlot[f[x, y], {x, -2, 2}, {y, -2, 2},
ContourShading → None, Contours → 20,
FrameLabel → {, }],  
  
ListPlot[points,
PlotStyle → {Blue, PointSize[Medium]},  
PlotMarkers → {, 8}],  
  
ListPlot[points,
PlotStyle → {Red, Thickness[0.005]},  
Joined → True],  
  
Graphics[{  
    Red, PointSize[Large], Point[First[points]],  
    Green, PointSize[Large], Point[Last[points]],  
    Black, PointSize[Small], Point[{0, 0}]  
}],  
  
PlotRange → {{-2, 2}, {-2, 2}},  
ImageSize → 500  
]  
],  
  
{{startPoint, {1.5, 1.5}}, Locator,  
Appearance → Style[#, Red, 18]},  
  
ControlPlacement → Left,  
TrackedSymbols → {startPoint, learningRate}  
]
```

Out[14]=

