

```

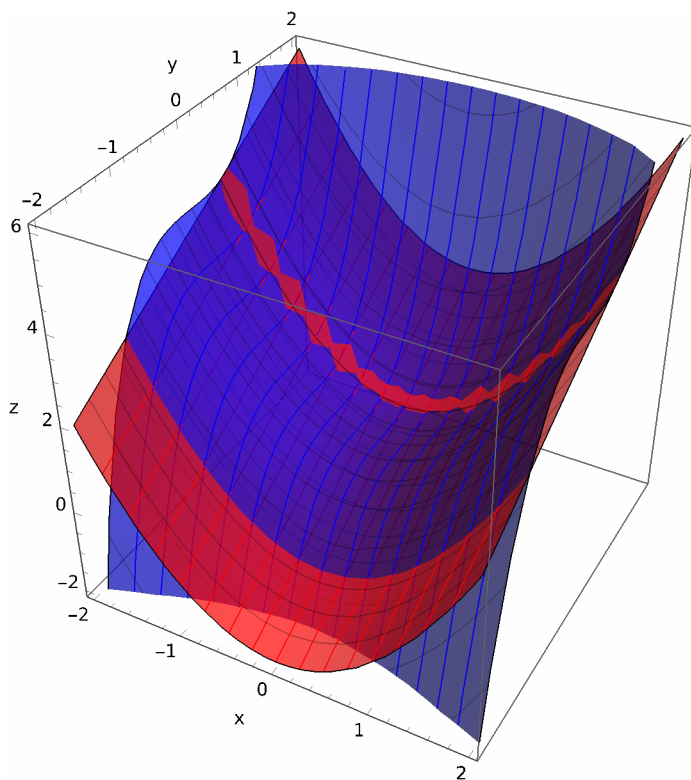
In[10]:= Show[
  Plot3D[x^2 + y, {x, -2, 2}, {y, -2, 2},
    PlotStyle → Directive[Opacity[0.7], Red],
    MeshStyle → {Red, Opacity[0.3]}],

  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
],

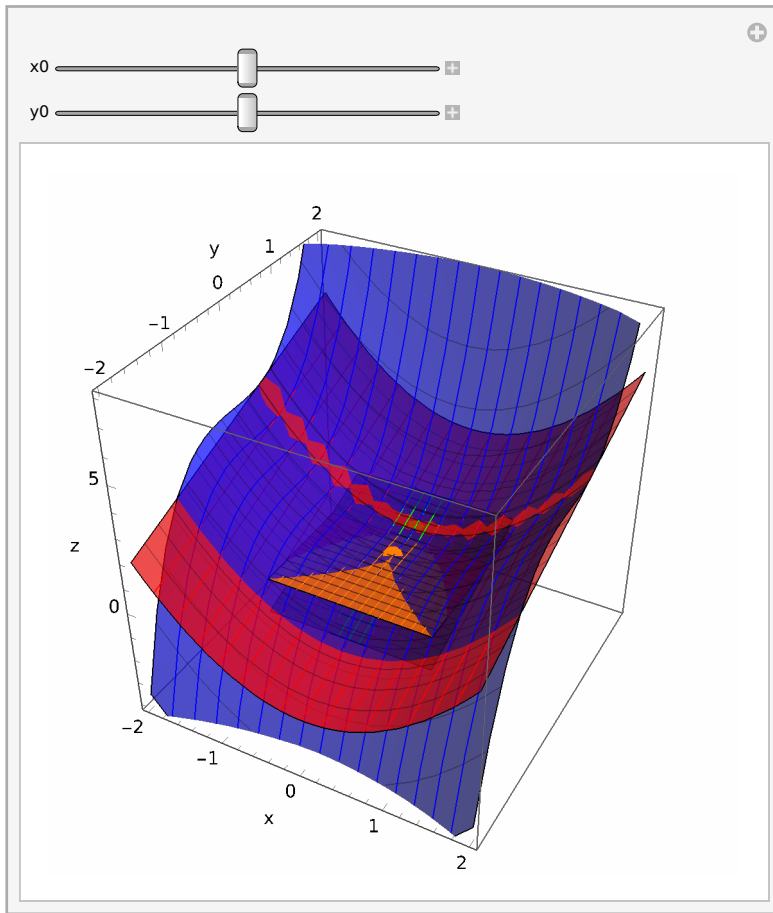
```

```

{{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],

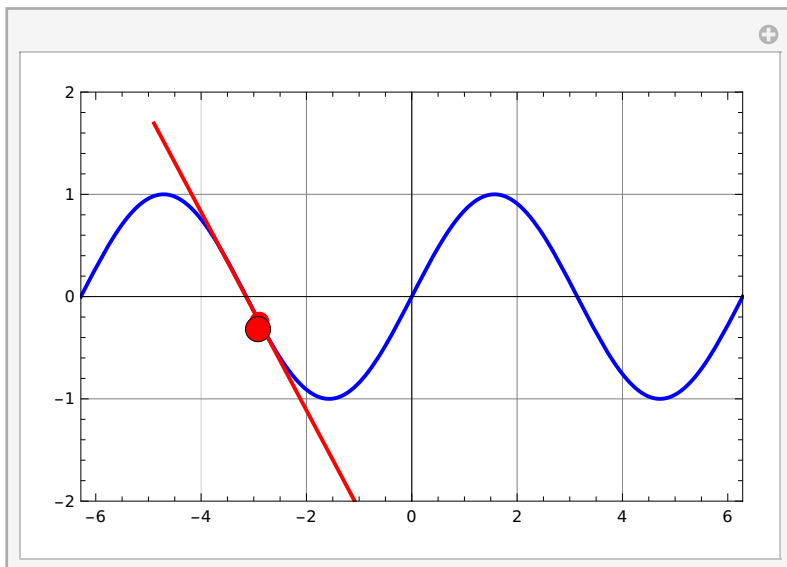
      Graphics[{
        Red, PointSize[0.03],
        Point[{x0, f[x0]}],
        Black
      }]
    ],

  {{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]=

