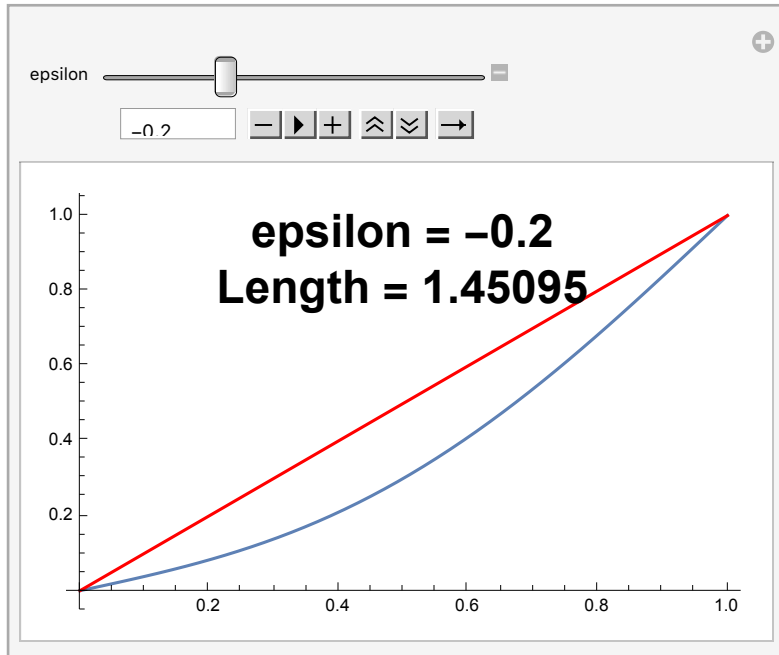


```
In[1]:= ClearAll["Global`*"];
```

```
Manipulate[
  Block[
    {m, b, eta, y, Y, f, L},
    m = 1;
    b = 0;
    L = 1;
    eta[x_] := Sin[Pi x / L];
    y[x_] := m x + b;
    Y[x_] := y[x] + epsilon*eta[x];
    f[x_, Y_, Yprime_] := Sqrt[1+Yprime^2];
    Show[

      Plot[Y[x], {x, 0, L}],
      Plot[y[x], {x, 0, L}, PlotStyle -> Red],
      Graphics[
        Text[Style[
          "Length = "<> ToString[NIntegrate[f[x, Y[x], Y'[x]], {x, 0, L}]],
          {Large, Bold}], {0.5, 0.8}]
      ],
      Graphics[
        Text[Style[
          "epsilon = "<> ToString[epsilon],
          {Large, Bold}], {0.5, 0.95}]
      ]
    ],
    {{epsilon, 0}, -0.5, 0.5}
  ]
```



```
In[10]:= ClearAll["Global`*"];
```

```
pathlength[epsilon_] :=
  Block[
    {m, b, eta, y, Y, f, L},
    m = 1;
    b = 0;
    L = 1;
    eta[x_] := Sin[Pi x / L];
    y[x_] := m x + b;
    Y[x_] := y[x] + epsilon*eta[x];
    f[x_, Y_, Yprime_] := Sqrt[1+Yprime^2];
    NIntegrate[f[x, Y[x], Y'[x]], {x, 0, L}]
  ];
Plot[pathlength[ε], {ε, -0.1, 0.1}]
```

```
Out[12]=
```

