CHAPTER-3 ASSIGNMENT

EXERCISE 3.2

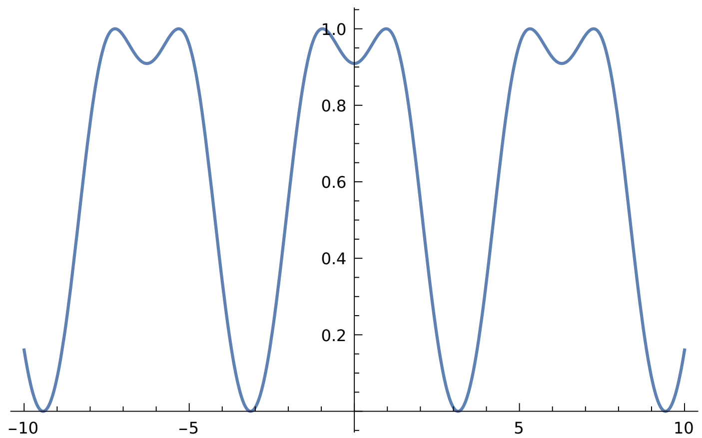
Q1) Plot the following functions on the domain -10≤ x≤ 10

a) sin(1+cosy)

In[7]:= `f[y_] := Sin[1 + Cos[y]]`

In[8]:= `Plot[f[y], { y, -10, 10}]`

Out[8]=

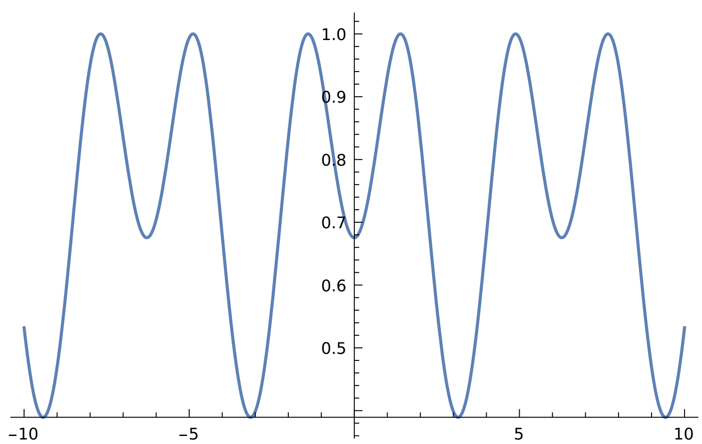


b)sin(1.4+cosx)

In[10]:= `f[x_] := Sin[1.4 + Cos[x]]`

In[11]:= `Plot[f[x], { x, -10, 10}]`

Out[11]=

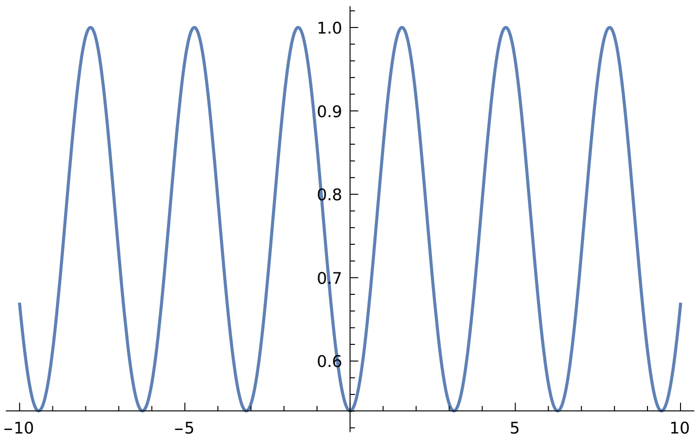


c)sin(π/2+cosx)

In[13]:=
```
f[x_] := Sin[(π / 2) + Cos[x]]
```

In[14]:=
```
Plot[f[x], { x, -10, 10}]
```

Out[14]=

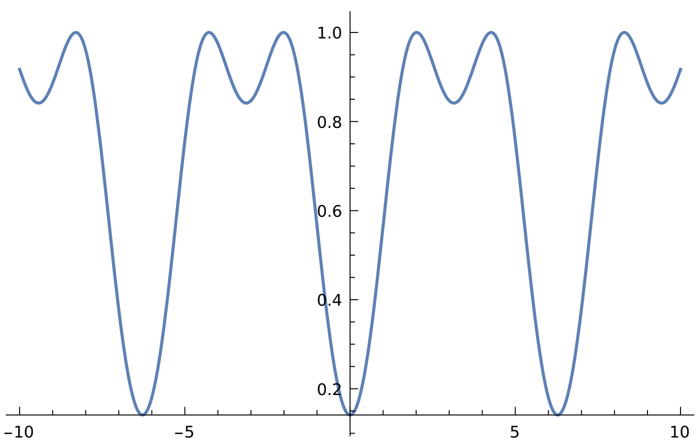


d)sin(2+cosx)

In[15]:=
```
f[x_] := Sin[2 + Cos[x]]
```

In[16]:=
```
Plot[f[x], { x, -10, 10}]
```

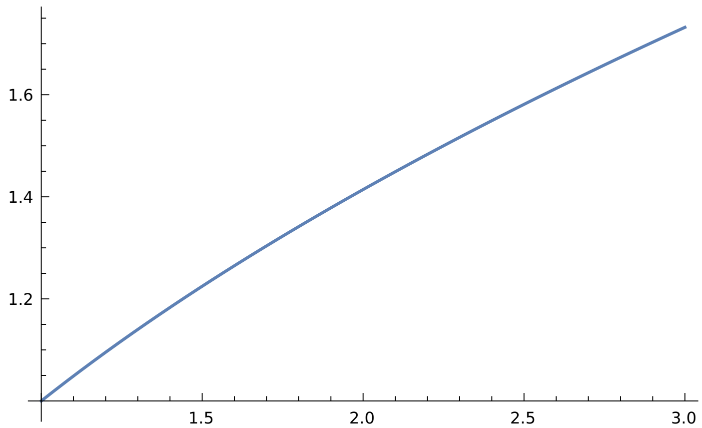
Out[16]=



Q2) One can zoom in toward a particular point in the domain of a function and see how the graph
appears at different zoom levels. For instance, consider the square root function f +x/ x when
x is near 2.
a. Enter the input below to see the graph of f as x goes from 1 to 3

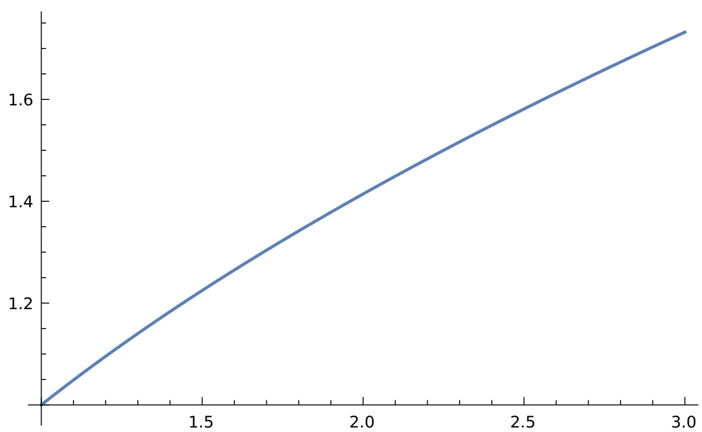
In[1]:= `Plot[√x, {x, 1, 3}]`

Out[1]=



In[17]:= `With[{δ = 10 ^ 0}, Plot[√x, {x, 2 - δ, 2 + δ}]]`

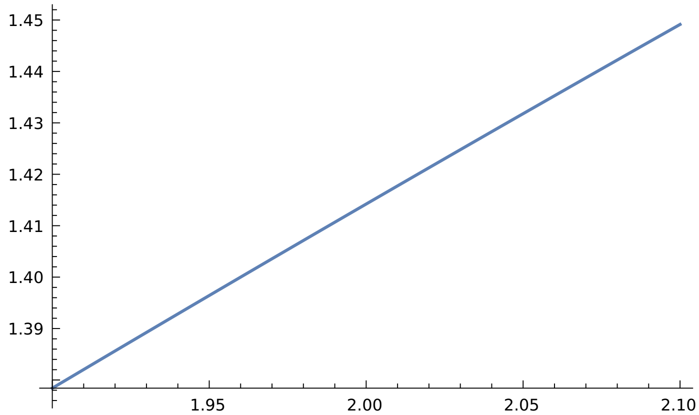
Out[17]=



b) Changing the values of 10^-1,10^-2,10^-3,10^-4,10^-5

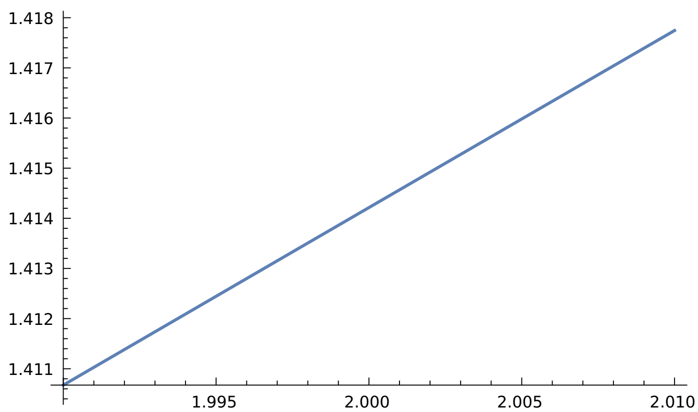
In[18]:=
```
With[{δ = 10^(-1)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[18]=



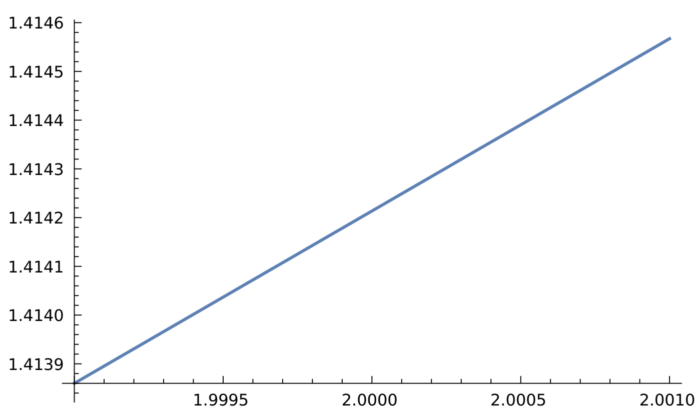
In[19]:=
```
With[{δ = 10^(-2)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[19]=



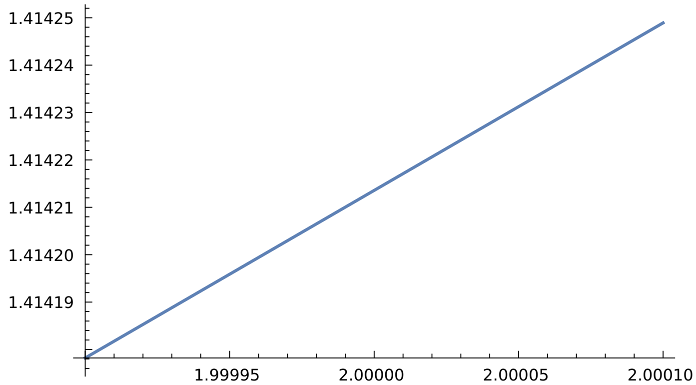
In[20]:=
```
With[{δ = 10^(-3)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[20]=



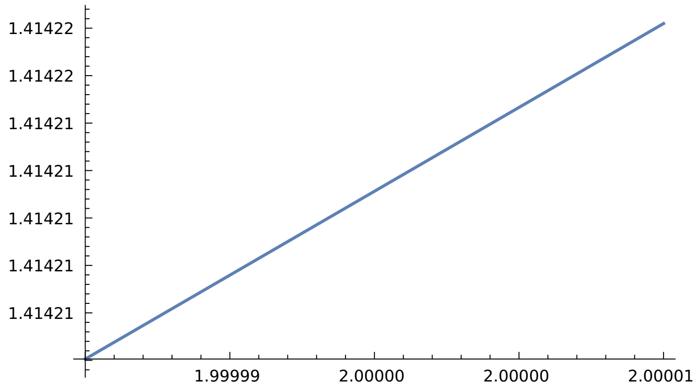
In[21]:=
```
With[{δ = 10^(-4)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[21]=



In[22]:=
```
With[{δ = 10^(-5)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[22]=



c)approximate the value of $\sqrt{2}$.

from the above graphs the value of $\sqrt{2}$ can be approximated at 1.41421

In[3]:=
```
N[√2 , 6]
```

Out[3]= 1.41421

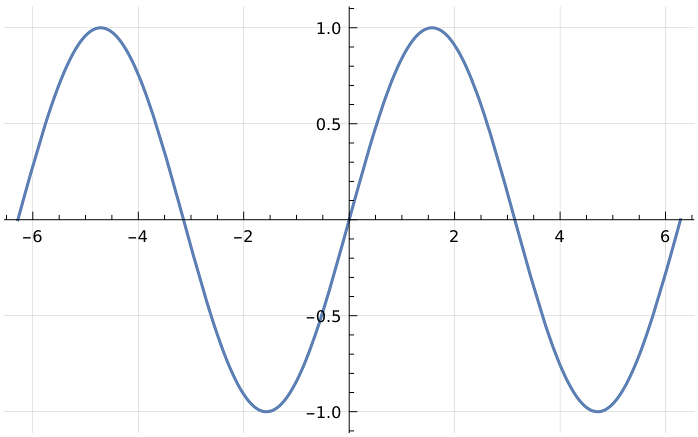
EXERCISE 3.3

1) Use the GridLines and Ticks options, as well as the setting GridLinesStyle Lighter[Gray]
 to produce the following Plot of the sine function:

the range given is (-2Pi,2Pi) on x axis and (-1,1) on y axis

In[58]:=
```
Plot[Sin[x], { x, -2 π, 2 π}, GridLines → Automatic ,
 GridLines → Lighter[Gray], Ticks → Automatic]
```

Out[58]=



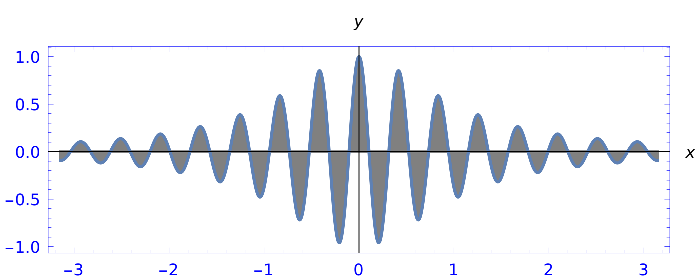
2)Use the Axes, Frame, Filling, FrameStyle, PlotRange, and AspectRatio options to produce the following plot of the function y= cos(15x)/ (1+x^2) :

In[60]:=
```
f[x_] := Cos[15 * x] / (1 + x ^ 2)
```

In[31]:=
```
Plot[f[x], {x, -2 π, 2 π}, Ticks → Automatic , AxesOrigin → {-3, -1}, AspectRatio → 8 / 20]
```

In[64]:=
```
Plot[f[x], {x, -Pi , Pi}, Axes → True , AxesLabel → {x, y},
 AxesStyle → Directive[Black], Frame → True, Filling → Axis, FillingStyle → Gray,
 FrameStyle → Blue, PlotRange → Full, AspectRatio → Automatic]
```

Out[64]=



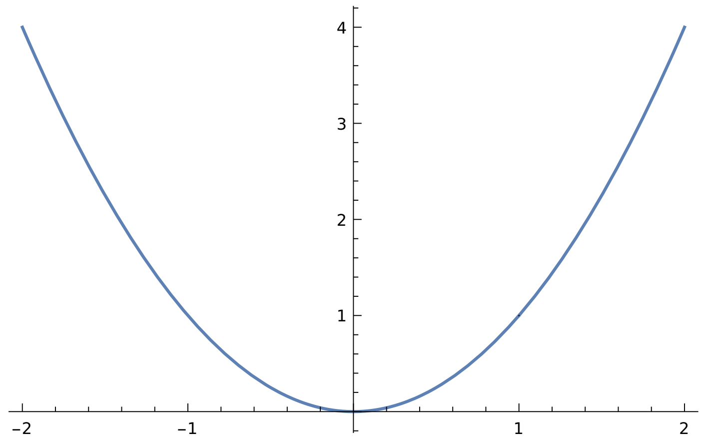
4) Plot the function f(x)= x^2 on the domain -2 ≤x≤ 2, and set Exclusions to x=1.

Note that f has no vertical asymptote at x =1. What happens?

In[6]:=
```
f[x_] := x^2
```

In[10]:=
```
Plot[f[x], {x, -2, 2}, Exclusions → {x == 1}, ExclusionsStyle → Dashed]
```

Out[10]=



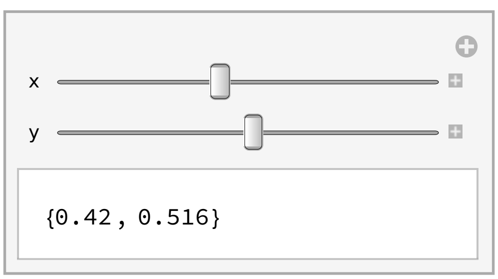
exclusions at x=1 has only a little visible effect on the graph at x=1 because there is no point of discontinuity.

EXERCISE 3.4

1)The following simple Manipulate has two sliders: one for x and one for y. Make a Manipulate that also has output {x,y}, but that has a single Slider2D controller.

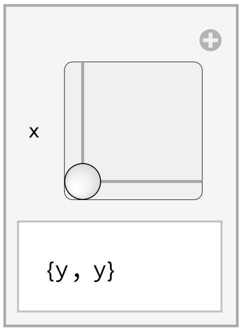
In[20]:=
```
Manipulate[{x, y}, {x, 0, 1}, {y, 0, 1}]
```

Out[20]=



In[65]:=
```
Manipulate[{x, y}, {x, y, {1, 1}}]
```

Out[65]=



2. Make a Manipulate of a Plot where the user can adjust the AspectRatio in real time, from a starting value of 1/5 (five times as wide as it is tall) to an ending value of 5 (five times as tall as it is wide). Set ImageSize to {Automatic, 128} so the height remains constant as the slider is moved.

EXERCISE3.5

1) The Partition command is used to break a single list into sublists of equal length. It is useful for breaking up a list into rows for display within a Grid

a) Enter the following inputs and discuss the outputs.

In[21]:=
```
Range[100]
```

Out[21]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41,
 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61,
 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,
 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}
```

In[22]:=
```
Partition[Range[100], 10]
```

Out[22]=
```
{{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {11, 12, 13, 14, 15, 16, 17, 18, 19, 20},
 {21, 22, 23, 24, 25, 26, 27, 28, 29, 30}, {31, 32, 33, 34, 35, 36, 37, 38, 39, 40},
 {41, 42, 43, 44, 45, 46, 47, 48, 49, 50}, {51, 52, 53, 54, 55, 56, 57, 58, 59, 60},
 {61, 62, 63, 64, 65, 66, 67, 68, 69, 70}, {71, 72, 73, 74, 75, 76, 77, 78, 79, 80},
 {81, 82, 83, 84, 85, 86, 87, 88, 89, 90}, {91, 92, 93, 94, 95, 96, 97, 98, 99, 100}}
```

b) Format a table of the first 100 integers, with twenty digits per row. The first rows, for example, should look like this

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

In[66]:=
```
Grid[Partition[Table[x, {x, 1, 100}], 20]]
```

Out[66]=

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

c. Make the same table as above, but use only the Table and Range commands. Do not use Partition.

In[67]:=
```
Grid[Table[Range[x, x + 19], {x, {1, 21, 41, 61, 81}}]]
```

Out[67]=

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

d. Make the same table as above, but use only the Table command (twice). Do not use Partition or Range.

In[68]:=
```
Grid[Table[Table[x, {x, x, x + 19}], {x, {1, 21, 41, 61, 81}}]]
```

Out[68]=

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

4. The Sum command has a syntax similar to that of Table.

a. Use the Sum command to evaluate the following expression: 1^3 +2^3 +3^3 ....+17^3 +18^3 +19^3 +20^3

In[47]:=
```
f[x_] := x^3
```

In[48]:=
```
Sum[f[x], {x, 1, 20}]
```

Out[48]= 44 100

b. Make a table of values for x 1, 2, … ,10 for the function g(x)= 1+2^x+3^x .... +19^x+20^x

In[53]:=
```
g[x_] := 1 + 2^x + 3^x + 4^x + 5^x + 6^x + 7^x + 8^x + 9^x + 10^x +
  11^x + 12^x + 13^x + 14^x + 15^x + 16^x + 17^x + 18^x + 19^x + 20^x
```

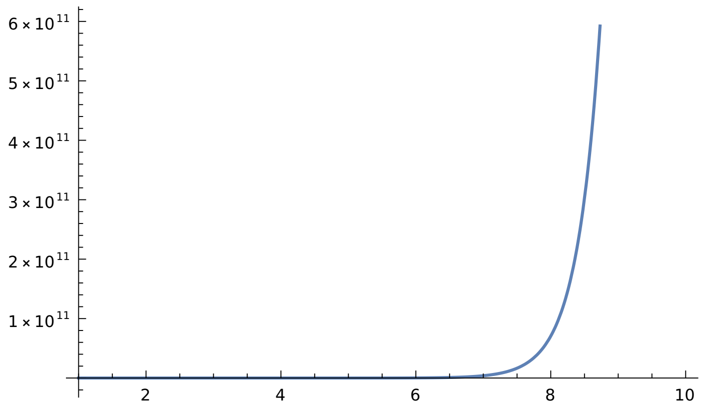
In[54]:=
```
Table[g[x], {x, 1, 10}]
```

Out[54]=
```
{210, 2870, 44100, 722666, 12333300, 216455810,
 3877286700, 70540730666, 1299155279940, 24163571680850}
```

c. Plot g(x) on the domain 1≤ x ≤10.

In[55]:=
```
Plot[g[x], {x, 1, 10}]
```

Out[55]=



EXERCISE3.6

5. Comments can be inserted directly into your input code. Any text placed between the (* and *) tokens will be ignored by the kernel when an input is entered. Comments do not affect the manner in which your code is executed, but they can be helpful to you or someone else who has to read and understand the code later. Look at the solution to the next exercise to see an example in which comments are used to help a reader find each of four items in a somewhat complex two by-two Grid.

In[70]:=
```
f[x_] := Piecewise[{{0, x < 0}, {x^2/2, 0 ≤ x ≤ 1},
   {-x^2 + 3 x - 3/2, 1 ≤ x < 2}, {1/2 (3 - x)^2, 2 ≤ x < 3}, {0, 3 ≤ x}}]
```

In[71]:=

```
Plot[f[x], {x, -3, 3}]
```

Out[71]=