MAT/19/96

ASSIGNMENT-2 (CHAPTER 3)

Exercises 3.2

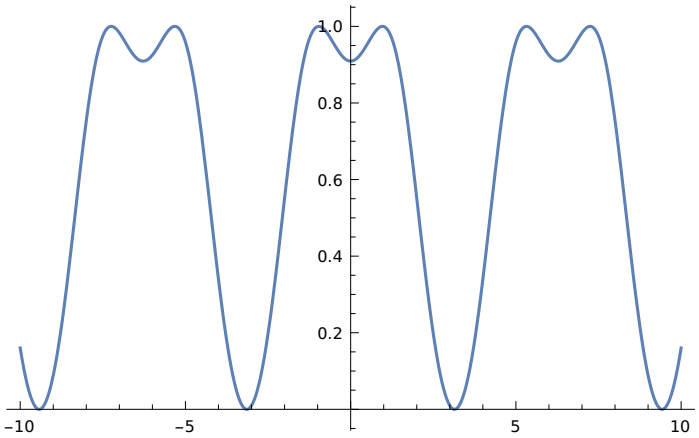
1- Plot the following functions on the domain -10≤x≤10.

a) Sin[1+Cos[x]]

In[189]:=
```
f[x_] := Sin[1 + Cos[x]]
```

In[190]:=
```
Plot[f[x], {x, -10, 10}]
```

Out[190]=

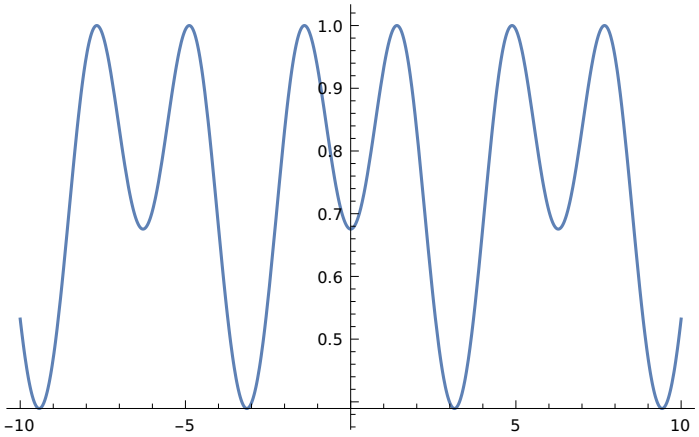


b) Sin[1.4+Cos[x]]

In[191]:=
```
g[x_] := Sin[1.4 + Cos[x]]
```

In[192]:=
```
Plot[g[x], {x, -10, 10}]
```

Out[192]=

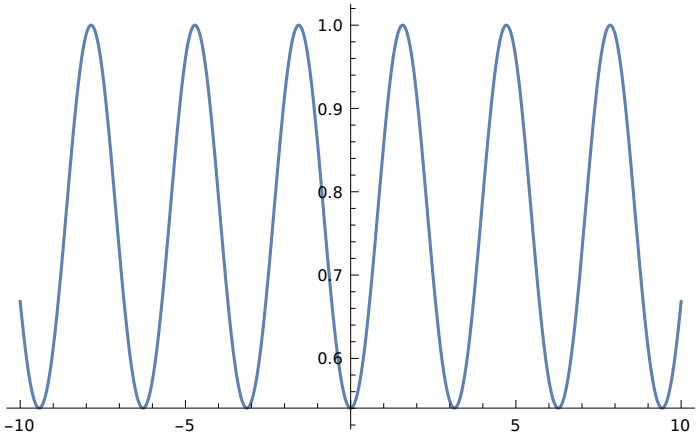


c) Sin[π/2+Cos[x]]

In[193]:=
```
h[x_] := Sin[π / 2 + Cos[x]]
```

In[194]:=
```
Plot[h[x], {x, -10, 10}]
```

Out[194]=

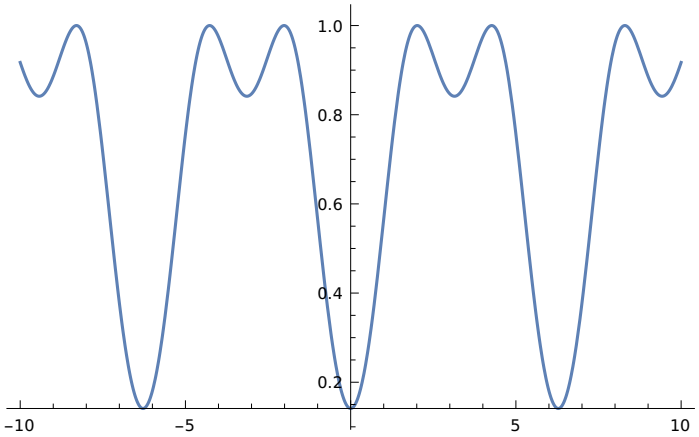


d) Sin[2+Cos[x]]

In[195]:=
```
i[x_] := Sin[2 + Cos[x]]
```

In[196]:=
```
Plot[i[x], {x, -10, 10}]
```

Out[196]=

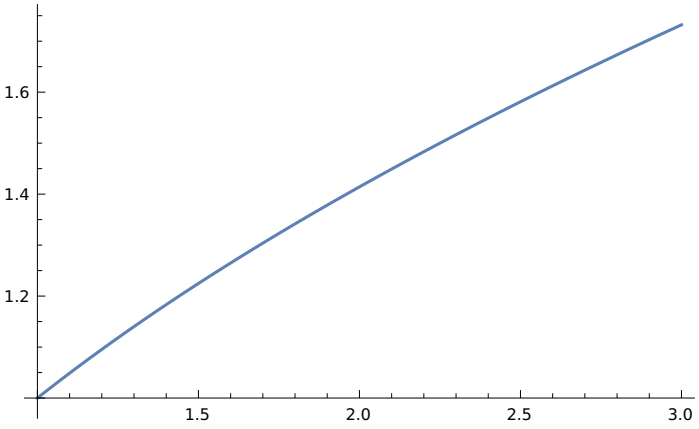


2- Consider the square root function f(x)= $\sqrt{}$x when x is near 2.

a) Graph of f as x goes from 1 to 3.

In[197]:=
```
With [{δ = 10 ^ 0}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

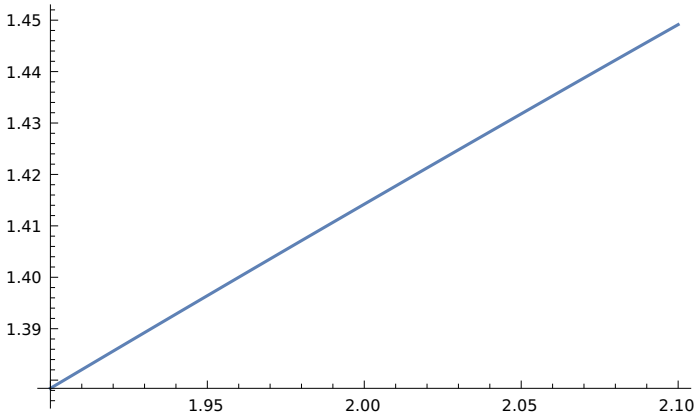
Out[197]=



b) Change the value of δ to be 10^-1,10^-2,10^-3 and see the graph of f as x goes from 1.9 to 2.1

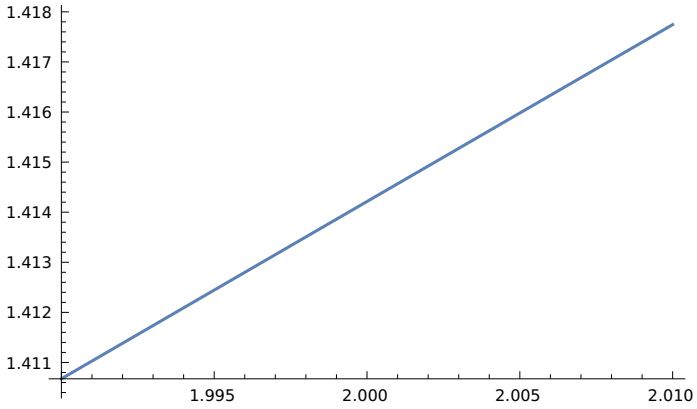
In[198]:=
```
With [{δ = 10 ^ -1}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[198]=



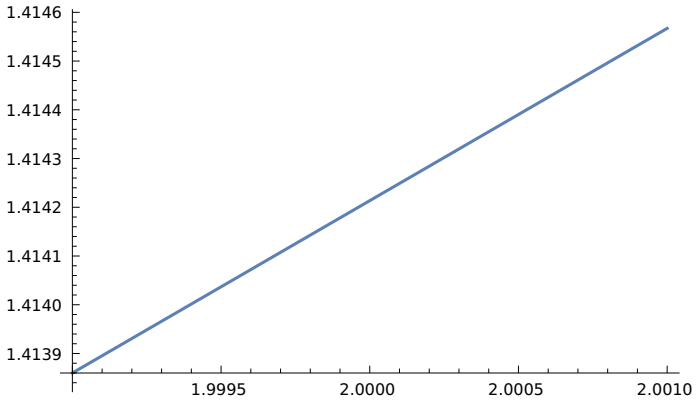
In[199]:=
```
With [{δ = 10 ^ -2}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[199]=



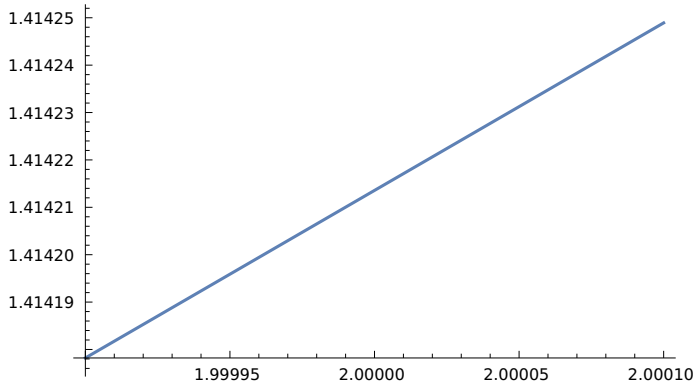
In[200]:=
```
With [{δ = 10 ^ -3}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[200]=



In[201]:=
```
With [{δ = 10^-4}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[201]=



c) Use the last plot to approximate $\sqrt{2}$ to six significient digits. Check your answer using N.

By the above plot we can approximate $\sqrt{2}$=1.41421

In[202]:=
```
N[√2, 6]
```

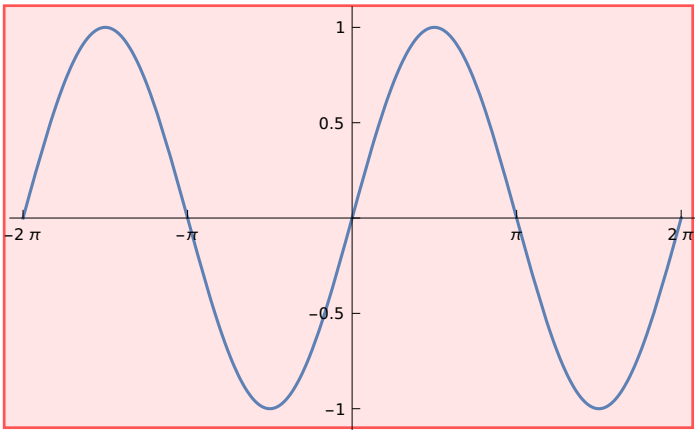
Out[202]=
```
1.41421
```

Exercises 3.3

1. Use the GridLines and Ticks options,as well as the setting GridLinesStyle -> Lighter[Gray] to plot the Sine function.

In[203]:=
```
Plot[Sin[x], {x, -2 Pi, 2 Pi}, GridLines → {Range[-2 Pi, 2 Pi, Pi/4] × Range[-1, 1, 0.2]},
 Ticks → {{-2 Pi, -Pi, Pi, 2 Pi}, {-1, -0.5, 0, 0.5, 1}}, GridLinesStyle → Lighter[Gray]]
```

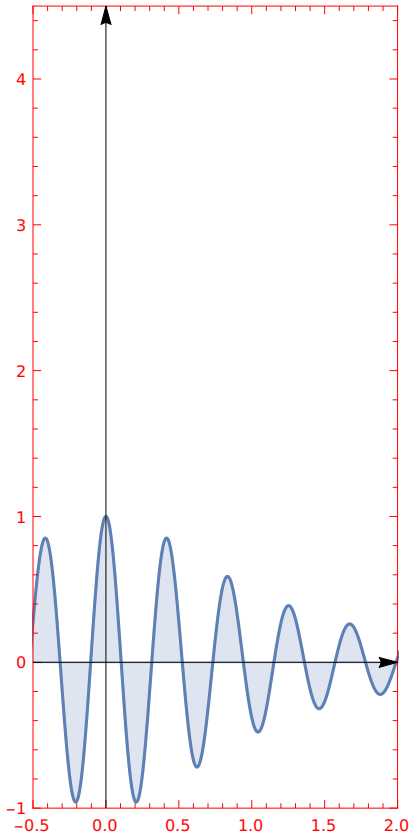
Out[203]=



2- Use the Axes ,Frame,Filling,FrameStyle,PlotRange and AspectRatio options to plot y=cos(15x)/1+x^2.

In[204]:=
```
Plot[Cos[15 x]/(1 + x ^ 2), {x, -Pi, Pi}, PlotRange → {{-0.5, 2}, {-1, 4.5}},
 Frame → True, AxesStyle → Arrowheads[00.05], AspectRatio → Automatic,
 Axes → {{True, False}, {True, False}} AxesLabel → {x, y},
 Filling → Axis, FrameStyle → Red]
```

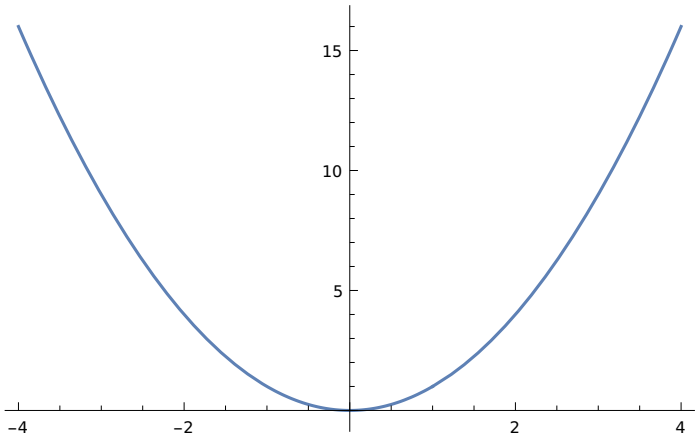
Out[204]=



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

In[205]:=
```
Plot[x^2, {x, -4, 4}, Exclusions → {x == 1}]
```

Out[205]=

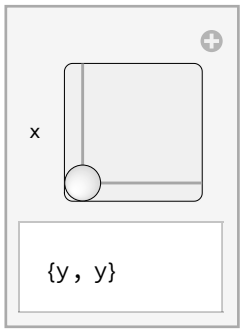


Exercises 3.4

1- Make a Manipulate has output {x,y},but has a single Slider2D controller.

In[206]:=
```
Manipulate[{x, y}, {x, y, {0, 1}}]
```

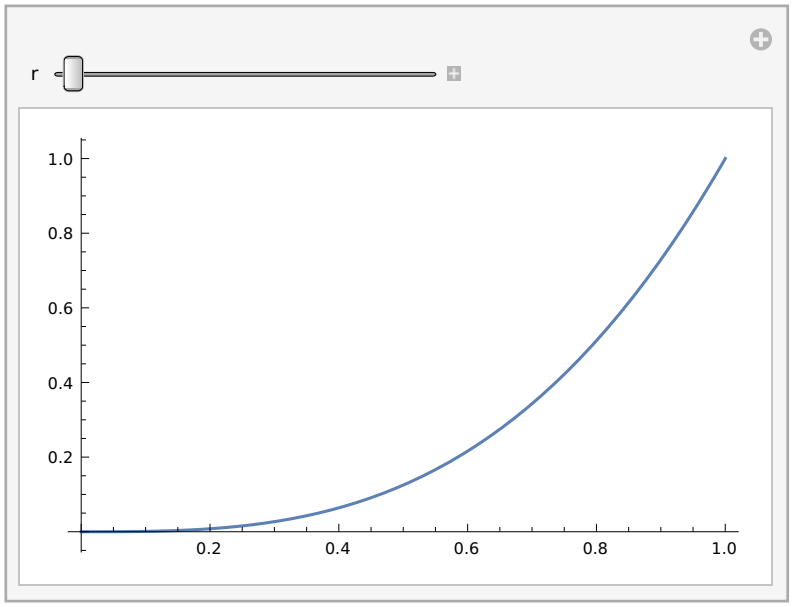
Out[206]=



2- Make a Manipulate of a plot where the user can adjust the AspectRatio in real time from starting value of 1/5 to an ending value of 5.Set image size to {Automatic128} so the height remains constant as the slider is moved.

In[207]:=
```
Manipulate[Plot[x^3, {x, 0, r}], {r, 1, 2}, ImageSize → {Automatic128}, AspectRatio → 5/6]
```

Out[207]=



Exercises 3.5

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 displays within a Grid.
a) Enter the following inputs and discuss the outputs.

In[208]:=
```
Range[100]
```

Out[208]=
```
{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[209]:=
```
Partition[Range[100], 10]
```

Out[209]=
```
{{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 two 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
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

In[210]:=
```
Table[x, {x, 1, 100}]
```

Out[210]=
```
{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[211]:=
```
Table[Range[10], 10]
```

Out[211]=
```
{{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10},
 {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10},
 {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10},
 {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10},
 {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}}
```

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

In[212]:=
```
Table[Table[x, {x, 1, 100}]]
```

Out[212]=
```
{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+4^3+5^3+6^3+7^3+8^3+9^3+10^3+11^3+12^3+13^3+14^3+15^3+16^3+17^3+18^3+19^3+20^3

In[213]:=
```
f[x_] := x^3
```

In[214]:=
```
Sum[f[x], {x, 1, 20}]
```

Out[214]=
```
44 100
```

b) Make a table of values for x=1,2,.....,10 for the function f(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[215]:=
```
f[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
Table[f[x], {x, 1, 10}]
```

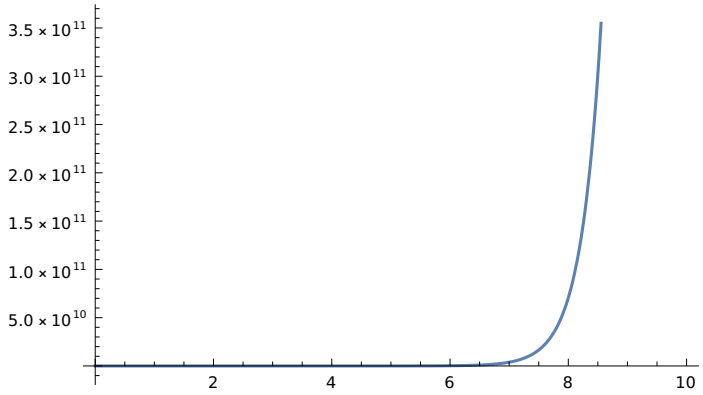
Out[216]=
```
{210, 2870, 44 100, 722 666, 12 333 300, 216 455 810,
  3 877 286 700, 70 540 730 666, 1 299 155 279 940, 24 163 571 680 850}
```

c) Plot f(x) on the domain 1≤x≤10.

In[217]:=
```
f[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[218]:=
```
Plot[f[x], {x, 0, 10}]
```

Out[218]=



Exercises 3.6

2- Make a plot of a piecewise function below and comment on its shape.

f(x)={0,x<0

x^2/2,0≤x<1

-x^2+3x-3/2,1≤x<2

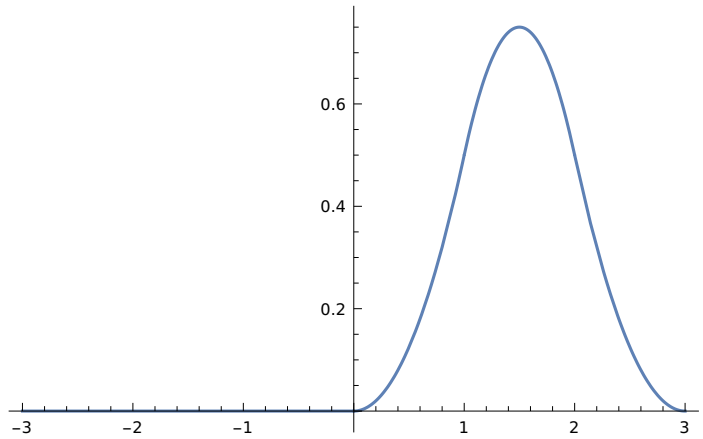
(1/2)(3-x)^2,2≤x<3

0,x≤3

In[219]:=
```
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, x ≤ 3}}]
```

In[220]:=
```
Plot[f[x], {x, -3, 3}]
```

Out[220]=



3- A step function assumes a constant value between consecutive integers n

and n+1.Make a plot of the step function f(x) whose value is n^2 when n≤ x<n+1. Use the domain 0≤x<20.

In[3]:=
```
f[x_] := Piecewise[{{n^2, n <= x < n + 1}, {1, n <= x <= n + 1}}]
```

In[5]:=
```
Plot[f[x], {x, 0, 20}]
```

Out[35]=