Chapter 3

Section 3.2

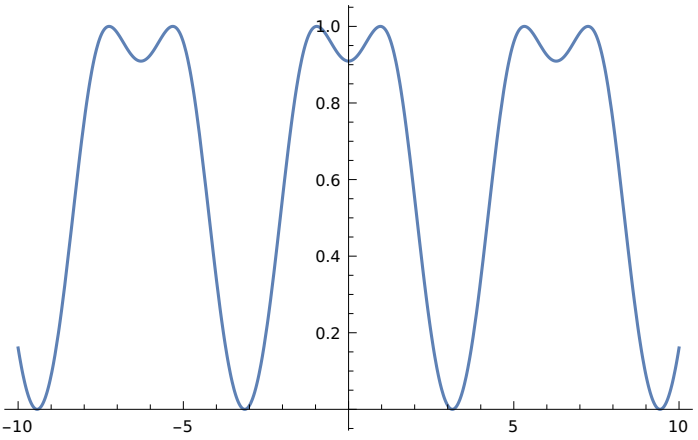
Question 1) Plot the following functions on the domain -10 <= x <= 10.

(a) f(x) = Sin [(1+Cos[x])]

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

In[2]:=
```
Plot[f[x], {x, -10, 10}]
```

Out[2]=

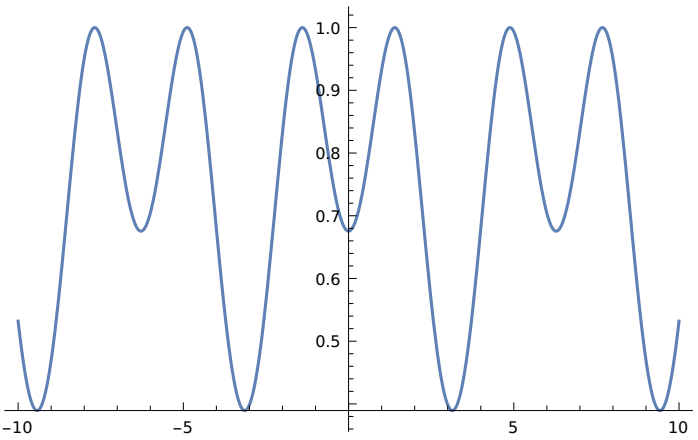


(b) g(x) = Sin[(1.4+Cos[x])]

In[3]:=
```
g[x_] := Sin[(1.4 + Cos[x])]
```

In[4]:=
```
Plot[g[x], {x, -10, 10}]
```

Out[4]=

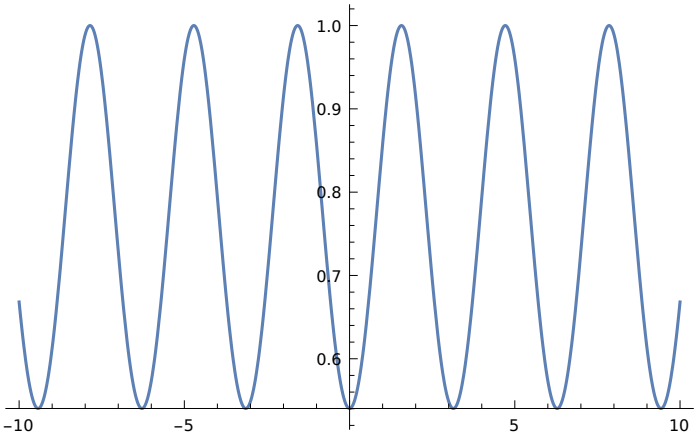


(c) t(x) = Sin[(Pi/2+Cos[x])]

In[5]:=
```
t[x_] := Sin[(Pi / 2 + Cos[x])]
```

In[6]:=
```
Plot[t[x], {x, -10, 10}]
```

Out[6]=

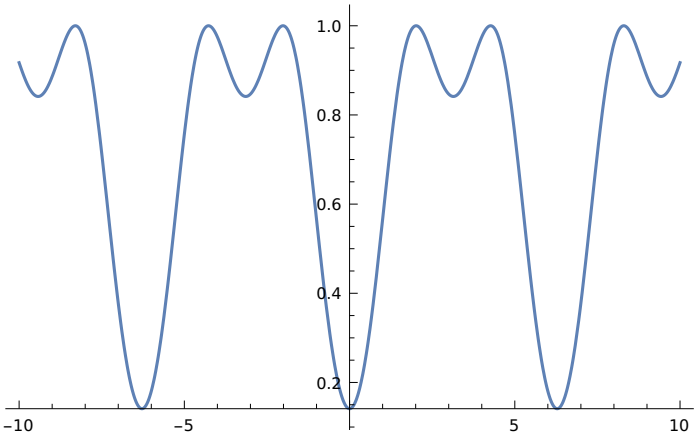


(d) k(x) = Sin[(2+Cos[x])]

In[7]:=
```
k[x_] := Sin[(2 + Cos[x])]
```

In[8]:=
```
Plot[k[x], {x, -10, 10}]
```

Out[8]=

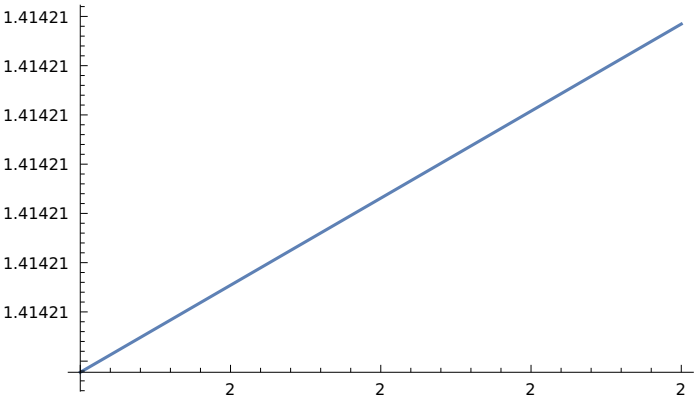


Question 2) Consider funtion f(x) = (x)^1/2 when x is near 2

In[1]:=
```
f[x_] := x^(1 / 2)
```

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

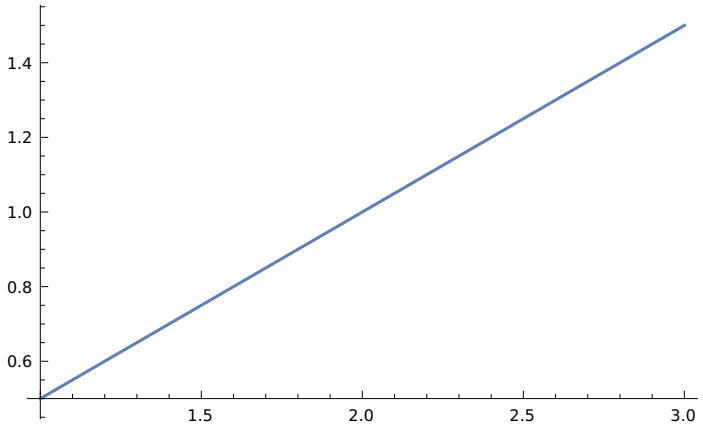
Out[2]=



(a) Enter the input to see the graph of f as x goes from 1 to 3

In[1]:=
```
With[{δ = 10^0}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

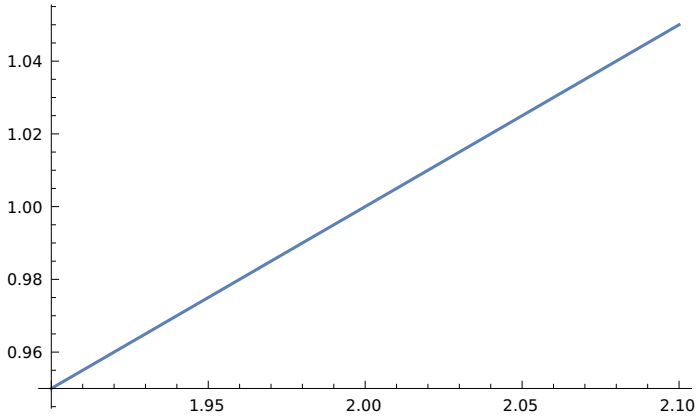
Out[1]=



(b)

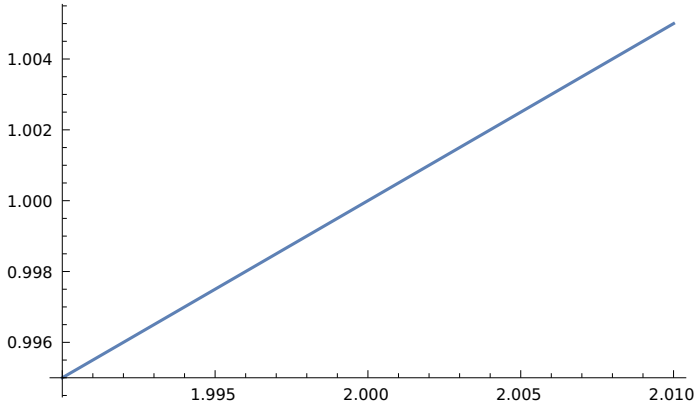
In[2]:=
```
With[{δ = 10^(-1)}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

Out[2]=



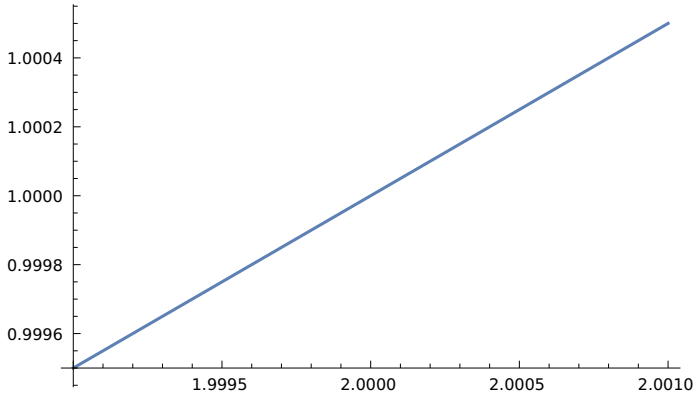
In[3]:=
```
With[{δ = 10^(-2)}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

Out[3]=



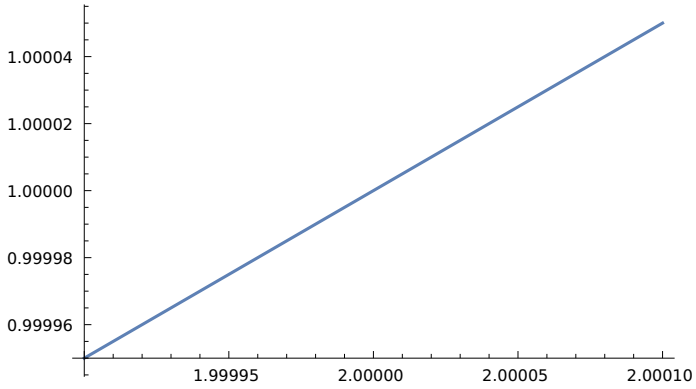
In[4]:=
```
With[{δ = 10^(-3)}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

Out[4]=



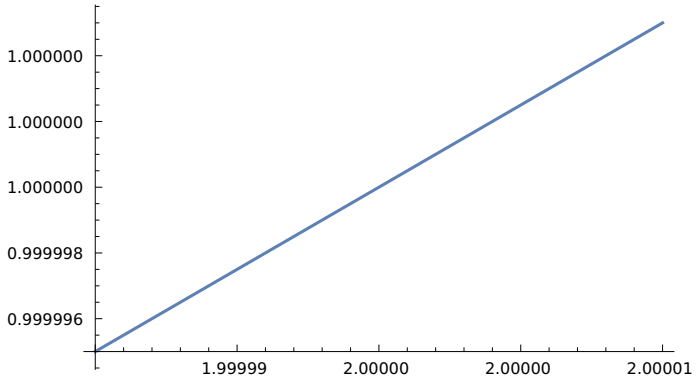
In[5]:=
```
With[{δ = 10^(-4)}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

Out[5]=



In[6]:=
```
With[{δ = 10^(-5)}, Plot[x^1/2, {x, 2 - δ, 2 + δ}]]
```

Out[6]=



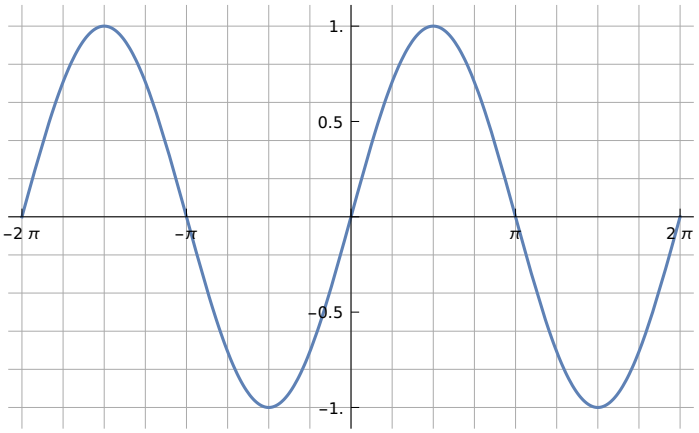
Section 3.3

Question 1) Plot the Sin function using the Gridlines and Ticks option

In[25]:=
```
f[x_] := Sin[x]
```

In[26]:=
```
Plot[f[x], {x, -2 Pi, 2 Pi}, GridLines → {Range[-2 Pi, 2 Pi, Pi / 4], Range[-1, 1, 0.2]},
 Ticks → {Range[-2 Pi, 2 Pi, Pi], Range[-1, 1, 0.5]}, GridLinesStyle → Lighter[Gray]]
```

Out[26]=

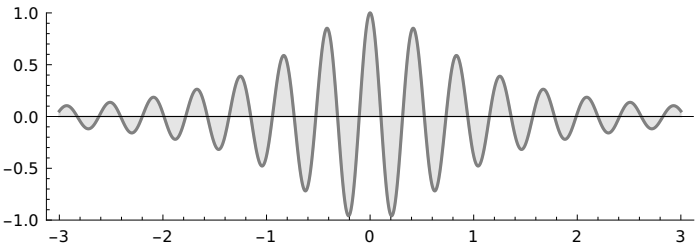


Question 2) Plot the function Cos[15 x]/(1+x^2) using Axes,Frame,Filling, Plot Range and Aspect Ratio.

In[28]:=
```
f[x_] := Cos[15 x] / (1 + x ^ 2)
```

In[30]:=
```
Plot[f[x], {x, -3, 3}, Axes → {True, False}, AspectRatio → Automatic,
 Filling → Axis, Frame → {{True, False}, {True, False}},
 FrameStyle → {Gray}, PlotStyle → {Gray}, PlotRange → {-1, 1}]
```

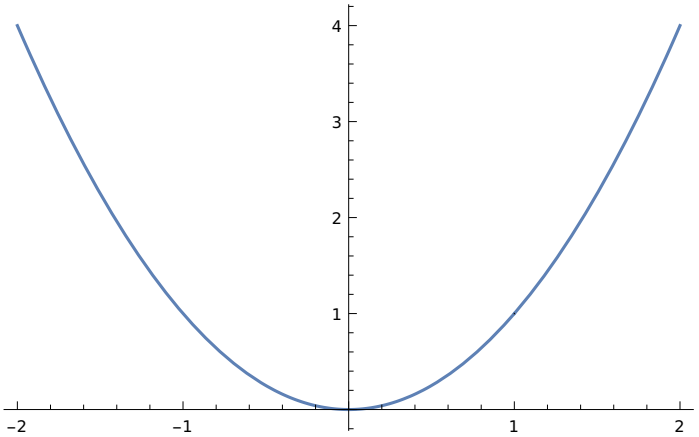
Out[30]=



Question 4) Plot the function x^2 on the domain -2 <=x <= 2 and set Exclusions to {x == 1}. Note that f has no vertical asymptote at x = 1.

In[18]:=
```
Plot[x^2, {x, -2, 2}, Exclusions → {x == 1}, ExclusionsStyle → Dashed]
```

Out[18]=



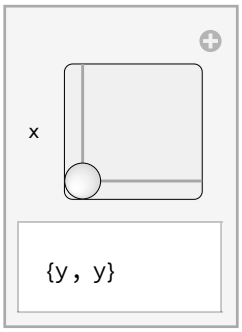
This function has no asymptote at x = 1.

Section 3.4

Question 1) Make a manipulate that also has output {x,y} but that has a single Slider 2D Controller.

In[11]:=
```
Manipulate[{x, y}, {x, y, {0, 1}}]
```

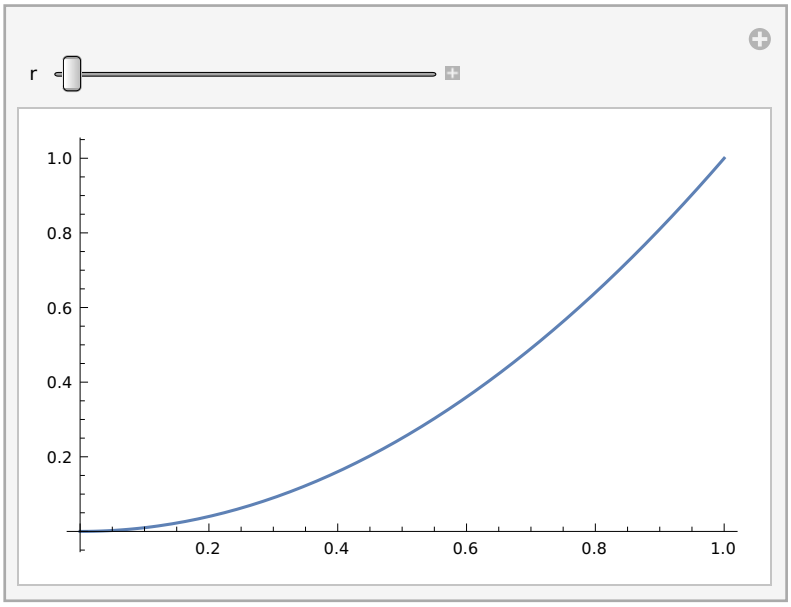
Out[11]=



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

In[12]:=
```
Manipulate[Plot[x^2, {x, 0, r}], {r, 1, 3}, ImageSize → {Automatic128}, AspectRatio → 5/6]
```

Out[12]=



Section 3.5

Question 1)

(a) Enter the following inputs and discuss the outputs

In[8]:=
```
Range[100]
```

Out[8]=
```
{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[4]:=
```
Partition[Range[100], 10]
```

Out[4]=
```
{{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 100 integers , with 20 digits per row.

In[13]:=
```
Grid[Partition[Range[100], 20]]
```

Out[13]=

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[14]:=
```
Grid[Table[Range[x, x + 19], {x, {1, 21, 41, 61, 81}}]]
```

Out[14]=

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 Table command (twice) .

In[31]:=
```
f[x_] := x
```

In[33]:=
```
Grid[Table[Table[f[x], {x, x, x + 19}], {x, {1, 21, 41, 61, 81}}]]
```

Out[33]=

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

Question 4)

(a) Use the Sum command to evaluate the following expression

In[10]:=
```
f[x_] := x^3
```

In[11]:=
```
Sum[f[x], {x, 1, 20}]
```

Out[11]= 44 100

(b) Make the 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[15]:=
```
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
```

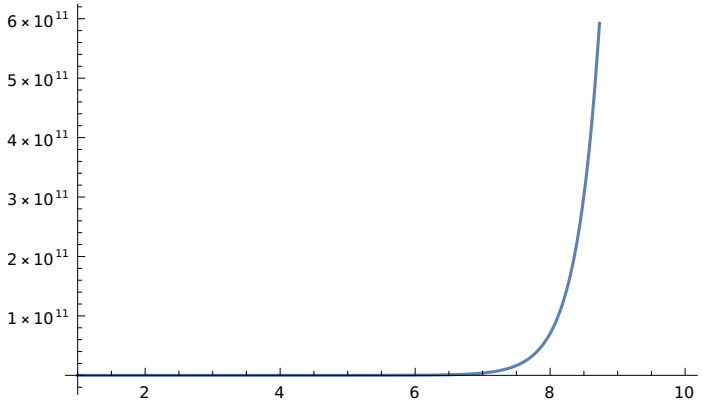
In[16]:=
```
Table[g[x], {x, 1, 10}]
```

Out[16]= {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 this function on the domain 1 <= x <= 10

In[17]:=
```
Plot[g[x], {x, 1, 10}]
```

Out[17]=



Section 3.6

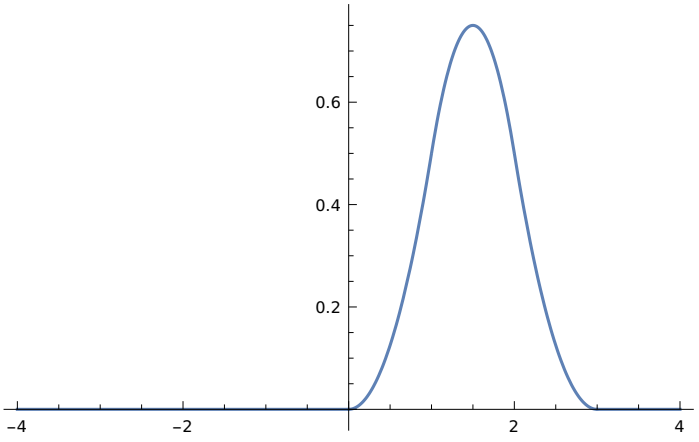
Question 2) Make a Plot of the Piecewise function

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 3 <= x; }

In[17]:=
```
f[x_] := Piecewise[{{0, (x < 0) || (3 ≤ x)}, {(x ^ 2) / 2, 0 ≤ x < 1},
    {(-(x ^ 2) + 3 x - 3 / 2), 1 ≤ x < 2}, {(1 / 2) * (3 - x) ^ 2, 2 ≤ x < 3}}]
```

In[22]:=
```
Plot[f[x], {x, -4, 4}]
```

Out[22]=



Question 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[22]:=
```
f[x_] := Piecewise[{{n^2, n ≤ x < n + 1}, {1, n ≤ x ≤ n + 1}}]
```

In[23]:=
```
Plot[f[x], {x, 0, 20}]
```

Out[23]=