Anshika Gahlot
MAT/19/59

CHAPTER 3 (TORRENCE)

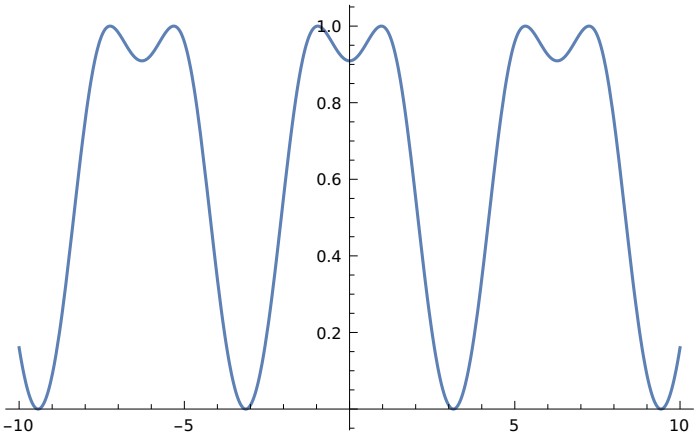
Section 3.2

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

a) sin(1+cos(x))

In[1]:=
```
Plot[Sin[1 + Cos[x]], {x, -10, 10}]
```

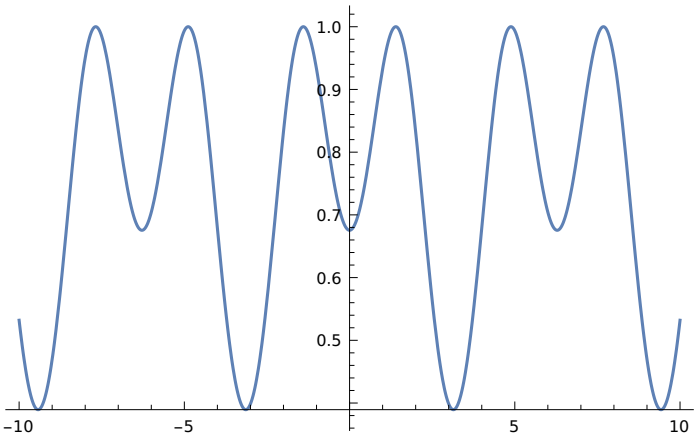
Out[1]=



b) sin(1.4+cos(x))

In[2]:=
```
Plot[Sin[1.4 + Cos[x]], {x, -10, 10}]
```

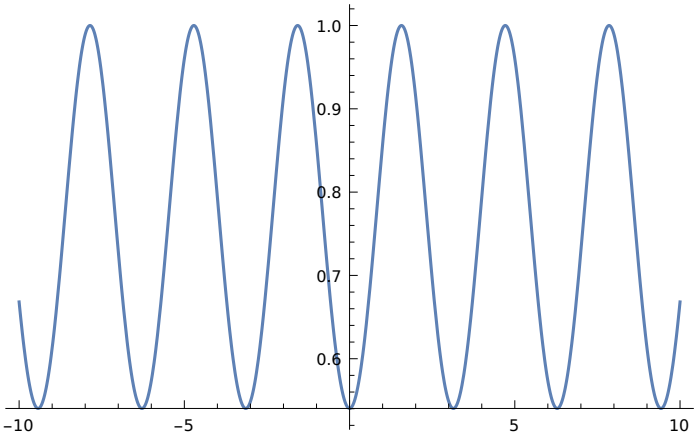
Out[2]=



c) sin(π/2 + cos(x))

In[3]:=
```
Plot[Sin[π / 2 + Cos[x]], {x, -10, 10}]
```

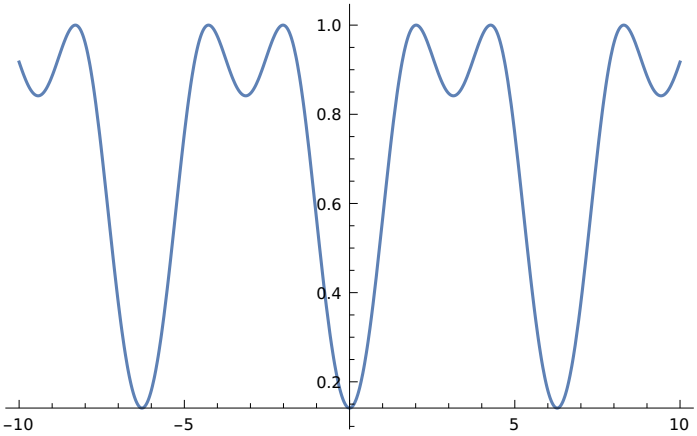
Out[3]=



d) sin(2+cos(x))

In[4]:=
```
Plot[Sin[2 + Cos[x]], {x, -10, 10}]
```

Out[4]=

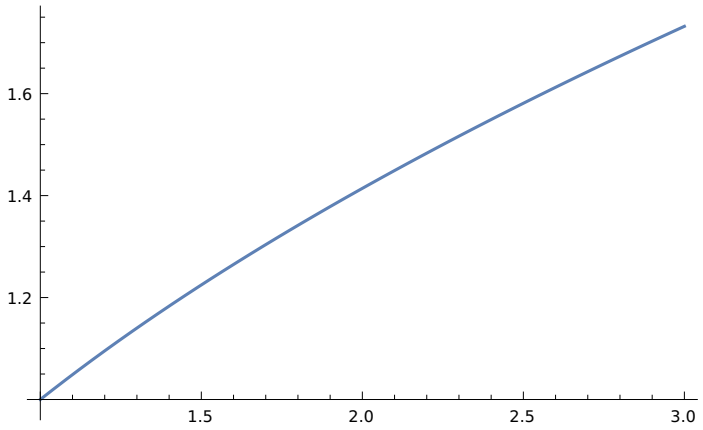


Ques 2 :

A)

In[5]:=
```
With[{δ = 10 ^ 0}, Plot[√x , {x, 2 - δ, 2 + δ}]]
```

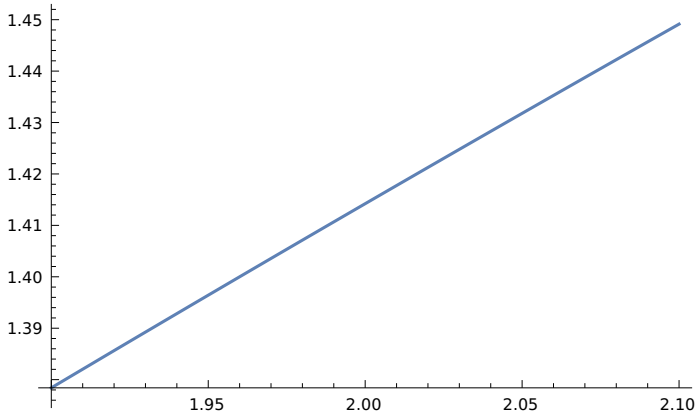
Out[5]=



B) $\delta = 10^{(-1)}$

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

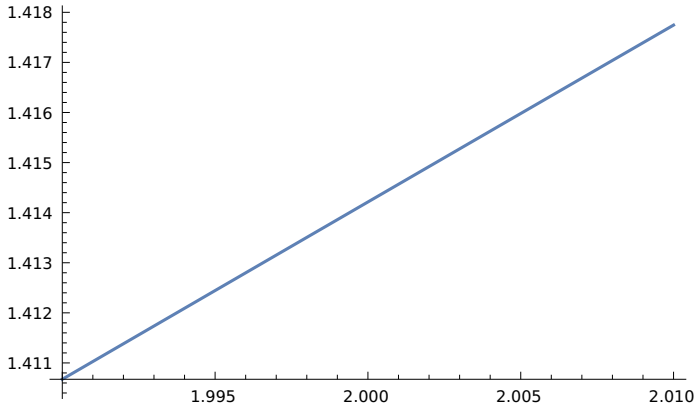
Out[6]=



δ = 10^(-2)

In[7]:=
```
With[{δ = 10^(-2)}, Plot[√x , {x, 2 - δ, 2 + δ}]]
```

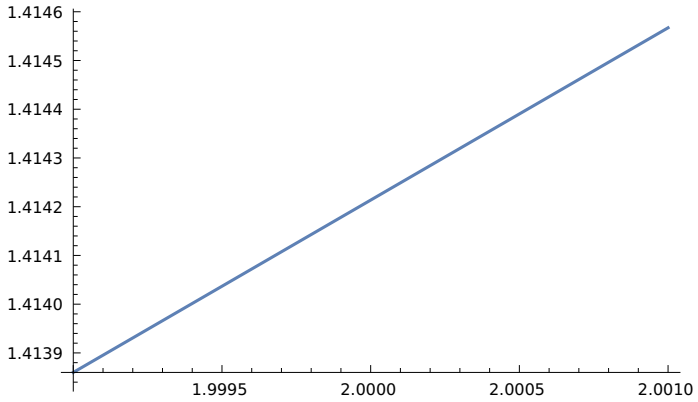
Out[7]=



δ = 10^(-3)

In[8]:=
```
With[{δ = 10^(-3)}, Plot[√x , {x, 2 - δ, 2 + δ}]]
```

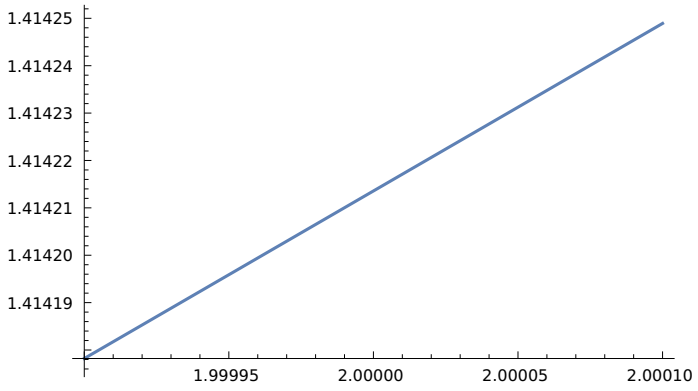
Out[8]=



δ = 10^(-4)

In[9]:=
```
With[{δ = 10^(-4)}, Plot[√x , {x, 2 - δ, 2 + δ}]]
```

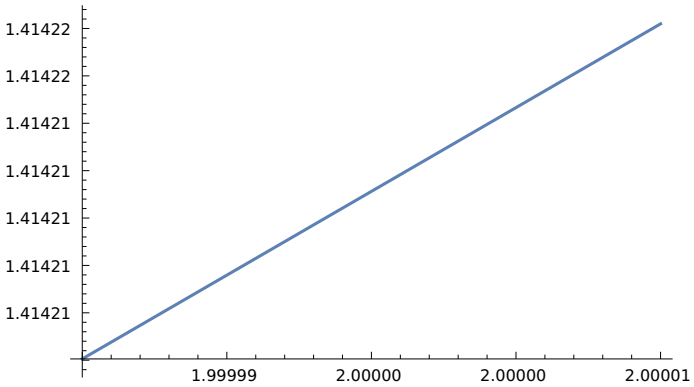
Out[9]=



δ = 10^(-5)

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

Out[10]=



C) $\sqrt{2}$

In[11]:=
```
N[√2, 6]
```

Out[11]=
```
1.41421
```

D)

In[13]:=
```
With[{δ = 10^-20}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

General : Further output of Plot::plld will be suppressed during this calculation .

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{10000000000000000000}, \frac{20000000000000000001}{10000000000000000000}\right\}$ must have distinct machine −precision numerical values .

General : Further output of Plot::plld will be suppressed during this calculation .

Out[13]=
$$\text{Plot}\left[\sqrt{x}, \left\{x, 2 - \frac{1}{100\,000\,000\,000\,000\,000\,000}, 2 + \frac{1}{100\,000\,000\,000\,000\,000\,000}\right\}\right]$$

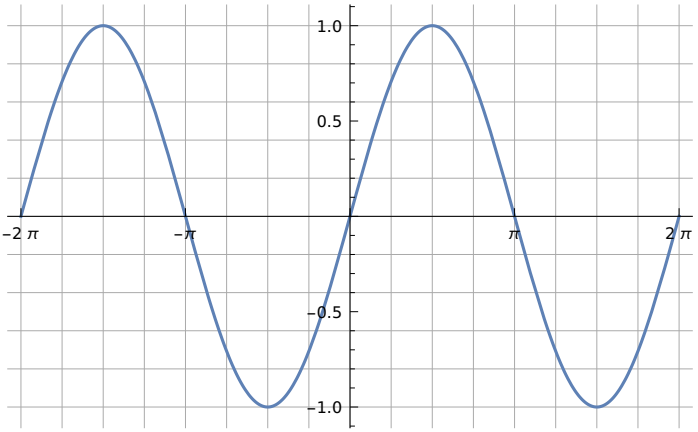
The two values and hence their difference is so small that it cannot be read by the computer thus mathematica is showing error.

Section 3.3

Ques 1 :

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

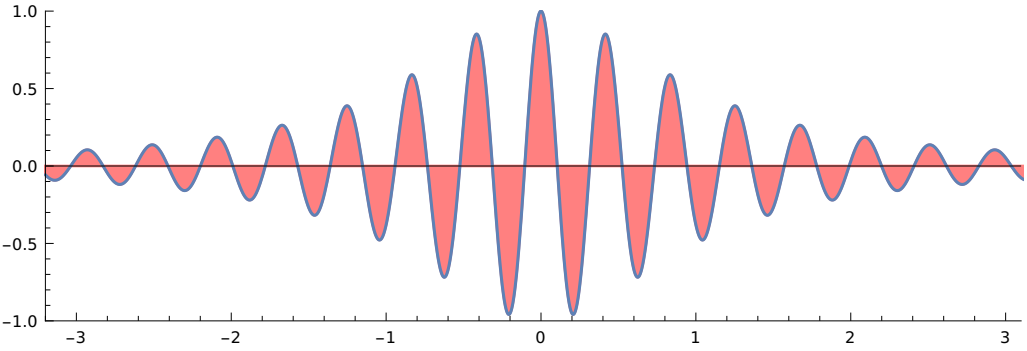
Out[4]=



Ques 2 :

In[9]:=
```
Plot[(Cos[15 x])/(1 + x^2), {x, -3.2, 3.2}, AspectRatio → Automatic,
 AxesOrigin → {-3, 0}, Frame → {{True, False}, {True, False}}, Axes → {x, y},
 PlotRange → {{-3.2, 3.1}, {-1, 1}}, Filling → Axis, FillingStyle → Pink]
```

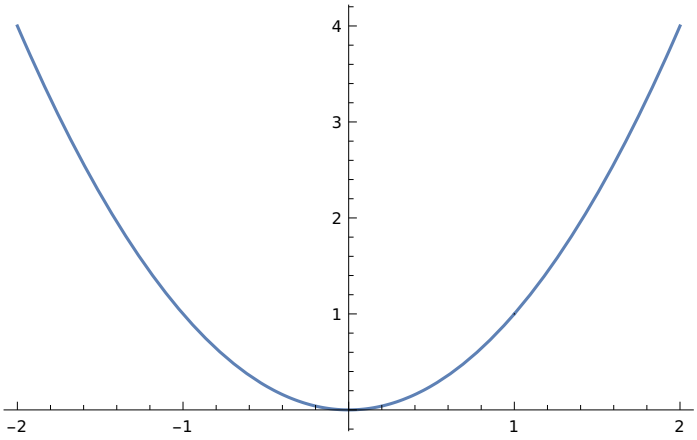
Out[9]=



Ques 4 :

In[3]:=
```
Plot[x^2, {x, -2, 2}, Exclusions → {x == 1}, ExclusionsStyle → Directive[Pink, Dashed]]
```

Out[3]=



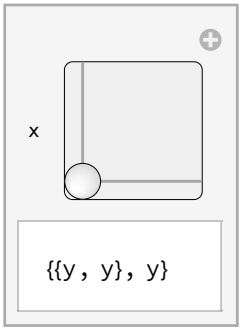
There is no vertical asymptote, this shows that the graph is continuous.

Section 3.4

Ques 1 :

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

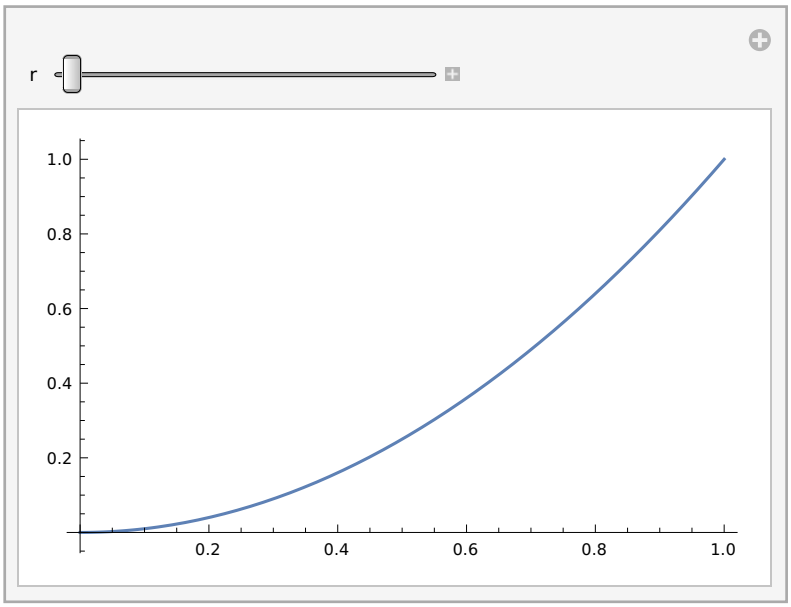
Out[1]=



Ques 2 :

In[13]:=
```
Manipulate[Plot[x^2, {x, 0, r}], {r, 1, 3},
 ImageSize → {Automatic , 128}, AspectRatio → 5 / 6]
```

Out[13]=



Section 3.5

Ques 1 :

A)

In[24]:=
```
Range[100]
```

Out[24]=
```
{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[25]:=
```
Partition[Range[100], 10]
```

Out[25]=
```
{{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}}
```

The Range[100] command displays numbers from 1 to 100 where as the command Partition[Range[100],10] displays the numbers from 1 to 100 while simultaneously segregating them in a list

of 10 numbers.

B)

In[3]:=
```
Grid[Partition[Range[100], 20]]
```

Out[3]=

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)

In[4]:=
```
Grid[Table[Range[x, x + 19], {x, {1, 21, 41, 61, 81}}]]
```

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

D)

In[5]:=
```
f[x_] := x
```

In[6]:=
```
Grid[Table[Table[f[x], {x, x, x + 19}], {x, {1, 21, 41, 61, 81}}]]
```

Out[6]=

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

Ques 4 :

A)

In[44]:=
```
f[x_] := x^3
```

In[46]:=
```
Sum[f[x], {x, 1, 20}]
```

Out[46]=
```
44 100
```

B)

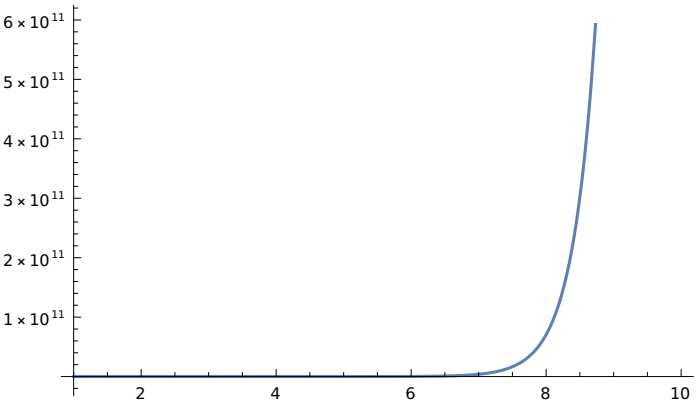
In[53]:=
```
f[x_] := 1 + 2^x + 3^x + 4^x + 5^x + 6^x + 7^x + 8^x + 9^x + 10^x +
11^x + 12^x + 13^x + 14^x + 15^x + 16^x + 17^x + 18^x + 19^x + 20^x
```

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

Out[54]=
```
{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}
```

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

Out[55]=



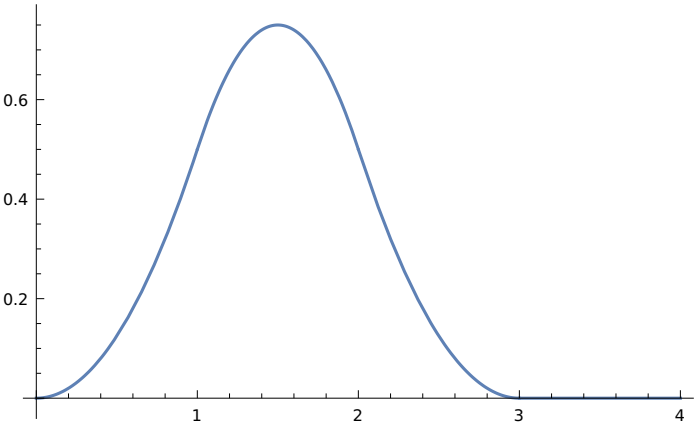
Section 3.6

Ques 2 :

In[2]:=
```
g[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[4]:=
```
Plot[g[x], {x, 0, 4}]
```

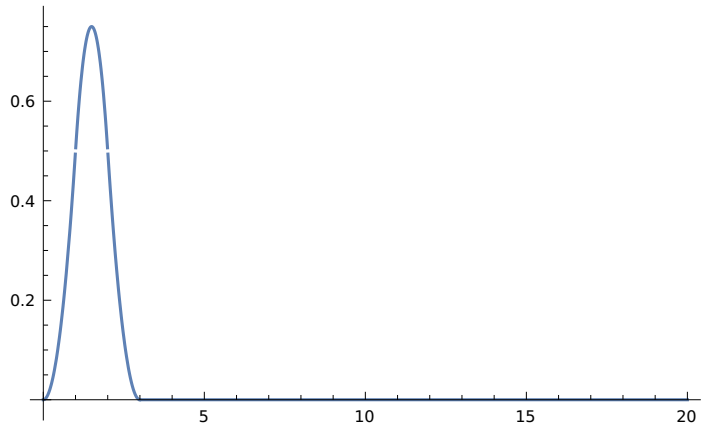
Out[4]=



Ques 3 :

In[14]:=
```
f[x_, n_] := Piecewise[{{n ^ 2, n ≤ x < n + 1}}]
```

In[15]:=
```
Plot[f[x, n], {x, 0, 20}]
```


0.6
0.4
0.2
5
10
15
20