ASSIGNMENT
(CHAPTER-3)

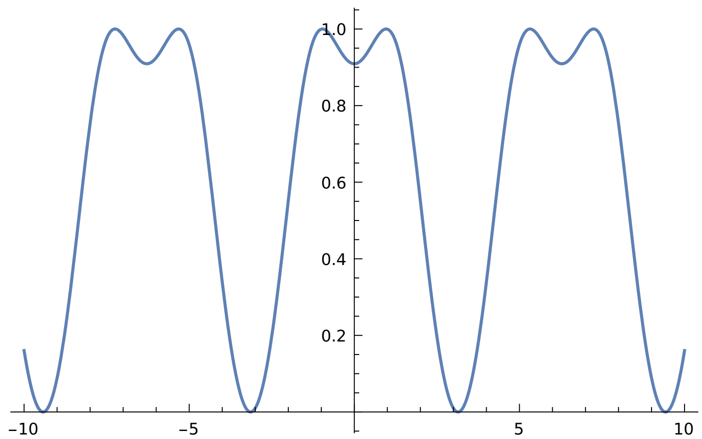
EX: 3.2

QUESTION 1: PLOT THE FOLLOWING FUNCTIONS ON THE DOMAIN -10≤x≤10.

a) sin(1+cos(x))

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

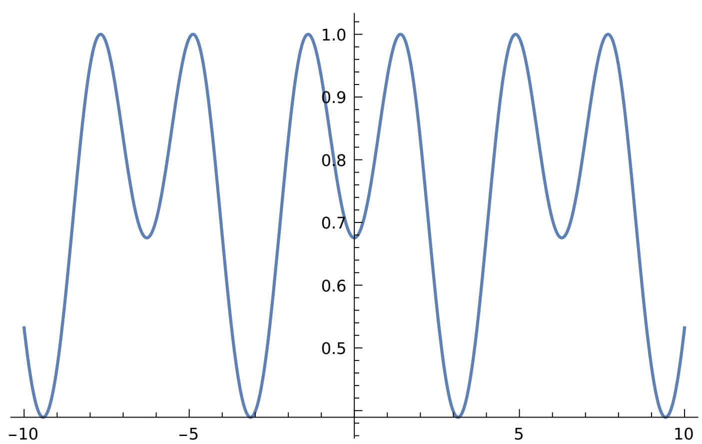
Out[2]=



b) sin(1.4+cos(x))

In[3]:=
```
g[x_] := Sin[1.4 + Cos[x]]
Plot[g[x], {x, -10, 10}]
```

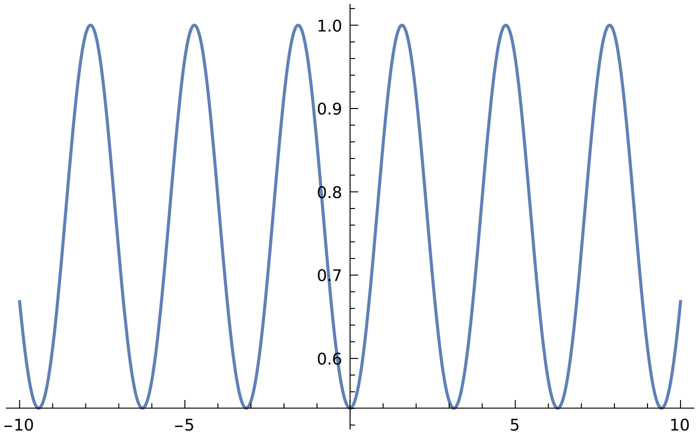
Out[4]=



c)sin(pi/2+cos(x))

In[5]:=
```
h[x_] := Sin[Pi / 2 + Cos[x]]
Plot[h[x], {x, -10, 10}]
```

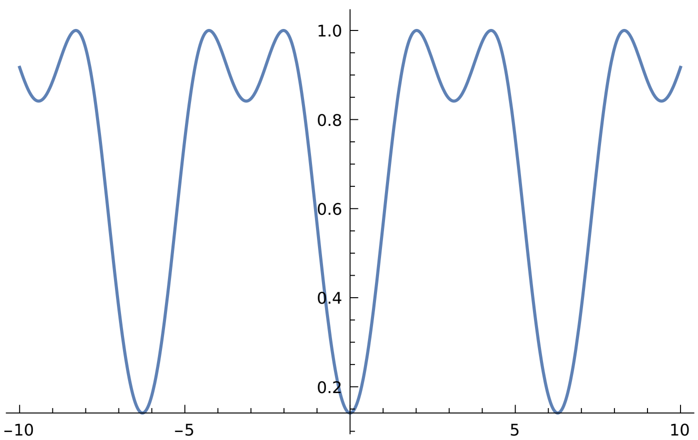
Out[6]=



d)sin(2+cos(x))

In[7]:=
```
f[x_] := Sin[2 + Cos[x]]
Plot[f[x], {x, -10, 10}]
```

Out[8]=

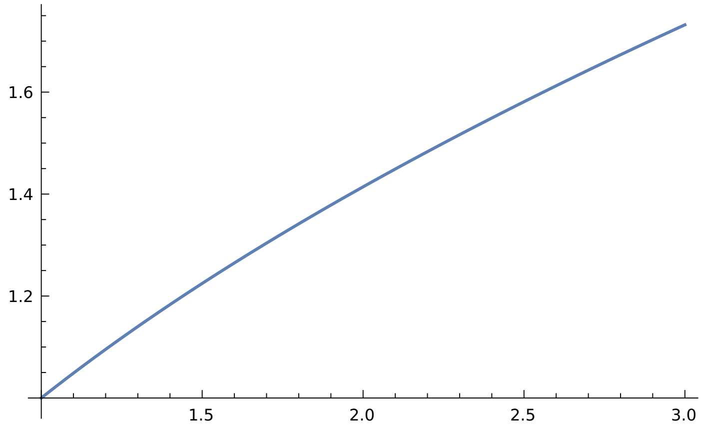


QUESTION 2: CONSIDER THE SQUARE ROOT FUNCTION f(x)=$\sqrt{x}$, WHEN x IS NEAR 2.

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

In[9]:=
```
With [{δ = 10 ^ 0}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

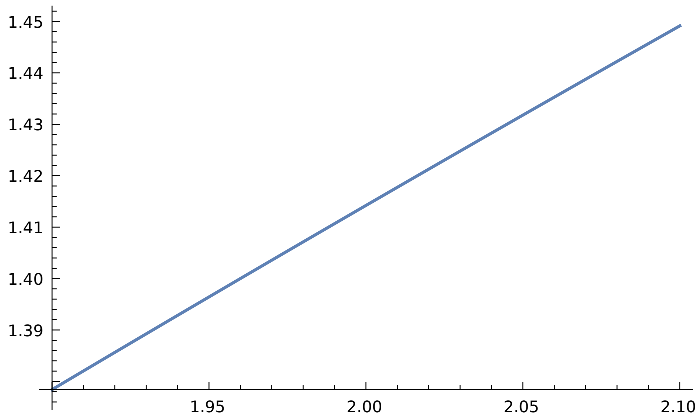
Out[9]=



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

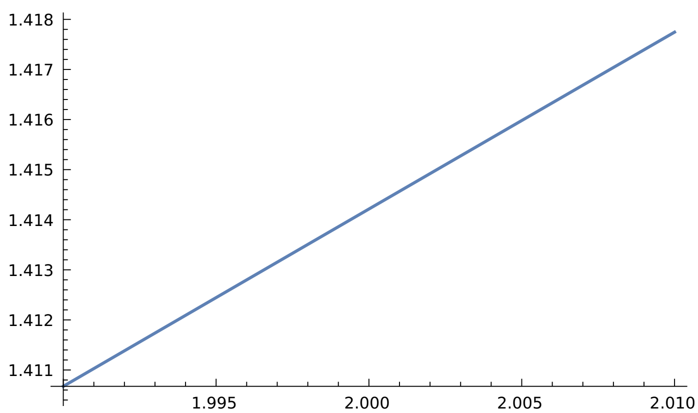
In[10]:=
```
With[{δ = 10 ^ - 1}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

Out[10]=



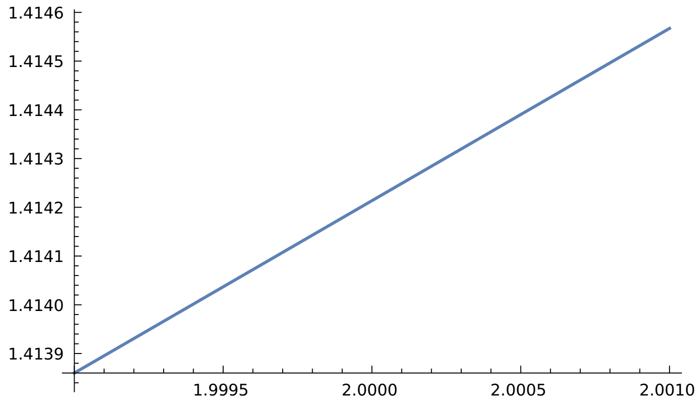
In[11]:=
```
With[{δ = 10 ^ - 2}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

Out[11]=



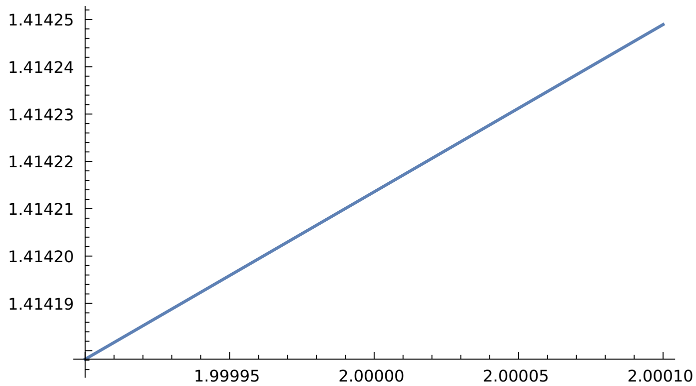
In[12]:=
```
With[{δ = 10^-3}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

Out[12]=



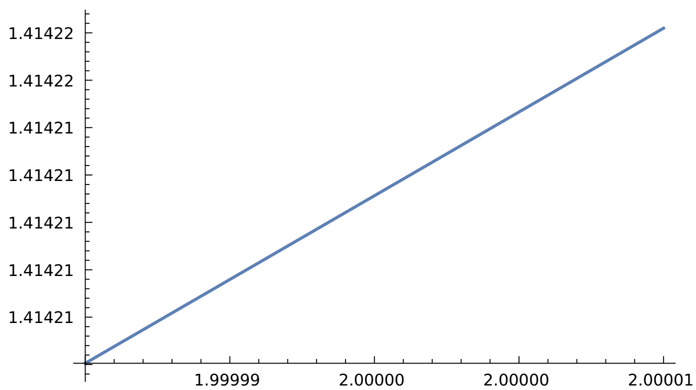
In[13]:=
```
With[{δ = 10^-4}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

Out[13]=



In[14]:=
```
With[{δ = 10^-5}, Plot[Sqrt[x], {x, 2 - δ, 2 + δ}]]
```

Out[14]=



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

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

In[15]:=
```
N[√2, 6]
```

Out[15]=
```
1.41421
```

d) When making a Plot, the lower and upper bounds on the iterator must be distinct when rounded to machine precision. Enter the previous Plot command with δ=10^-20.An error message

results. Read the error message and speculate as to what is happening. The bottom line is that zooming has its limits.

In[1]:=
```
With[{δ = 10^-20}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Plot : Endpoints for x in $\left\{x, \frac{199999999999999999999}{100000000000000000000}, \frac{200000000000000000001}{100000000000000000000}\right\}$ must have distinct machine -precision numerical values .

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Plot : Endpoints for x in $\left\{x, \frac{199999999999999999999}{100000000000000000000}, \frac{200000000000000000001}{100000000000000000000}\right\}$ must have distinct machine -precision numerical values .

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

Plot : Endpoints for x in $\left\{x, \frac{199999999999999999999}{100000000000000000000}, \frac{200000000000000000001}{100000000000000000000}\right\}$ must have distinct machine -precision numerical values .

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Plot : Endpoints for x in $\left\{x, \frac{199999999999999999999}{100000000000000000000}, \frac{200000000000000000001}{100000000000000000000}\right\}$ must have distinct machine -precision numerical values .

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

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

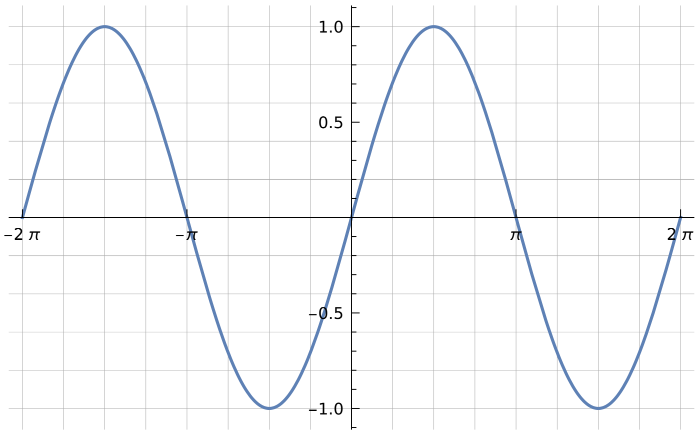
THE TWO VALUES AND HENCE THEIR DIFFERENCE IS SO SMALL THAT IT CANNOT BE READ BY THE COMPUTER THUS MATHEMATICA IS SHOWING ERROR.

EX:3.3

QUESTION 1: USE THE GRIDLINES AND TICK OPTIONS, AS WELL AS THE SETTING GRIDLINESSTYLE→LIGHTER[GRAY] TO PLOT THE SINE FUNCTION.

In[44]:=
```
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}]
```

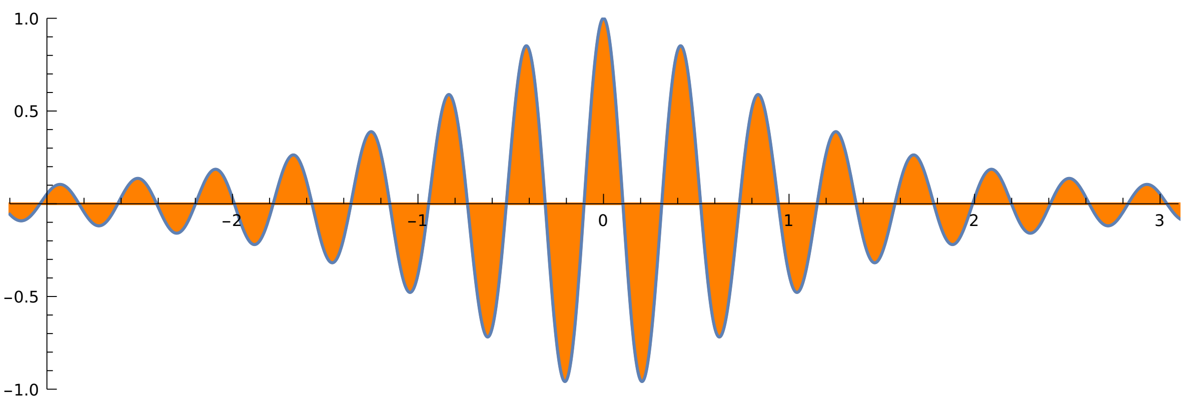
Out[44]=



QUESTION 2: USE THE AXES, FRAME, FILLING, FRAMESTYLE, PLOTRANGE AND ASPECTRATIO OPTIONS TO PLOT Y =Cos(15x)/1+x^2

In[53]:=
```
Plot[(Cos[15 * x]) / (1 + x ^ 2), {x, -3.2, 3.2}, AspectRatio → Automatic,
 AxesOrigin → {-3, 0}, Frame → {{True, False}}, Axes → {x, y},
 PlotRange → {{-3.2, 3.1}, {-1, 1}}, Filling → Axis, FillingStyle → Orange]
```

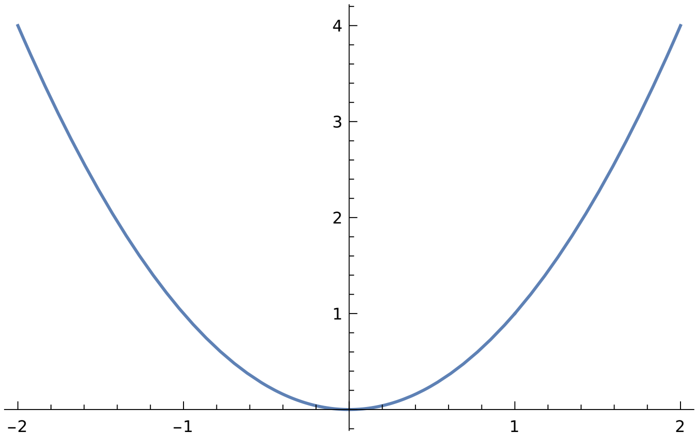
Out[53]=



QUESTION 4: PLOT THE FUNCTION f(x)=x^2 ON THE DOMAIN -2≤x≤2 AND SET EXCLUSIONS TO x=1

In[41]:=
```
Plot[x^2, {x, -2, 2}, Exclusions → {x == 1}]
```

Out[41]=



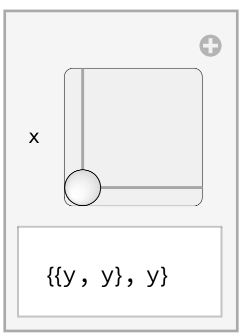
THERE IS NO VERTICAL ASYMPTOTE, THIS SHOWS THAT THE GRAPH IS CONTINUOUS.

EX:3.4

QUESTION 1: MAKE A MANIPULATE THAT HAS OUTPUT {x,y}, BUT THAT HAS A SINGLE SLIDE 2-D CONTROLLER.

In[19]:=
```
Manipulate[{x, y}, {x, y, {0, 1}}]
```

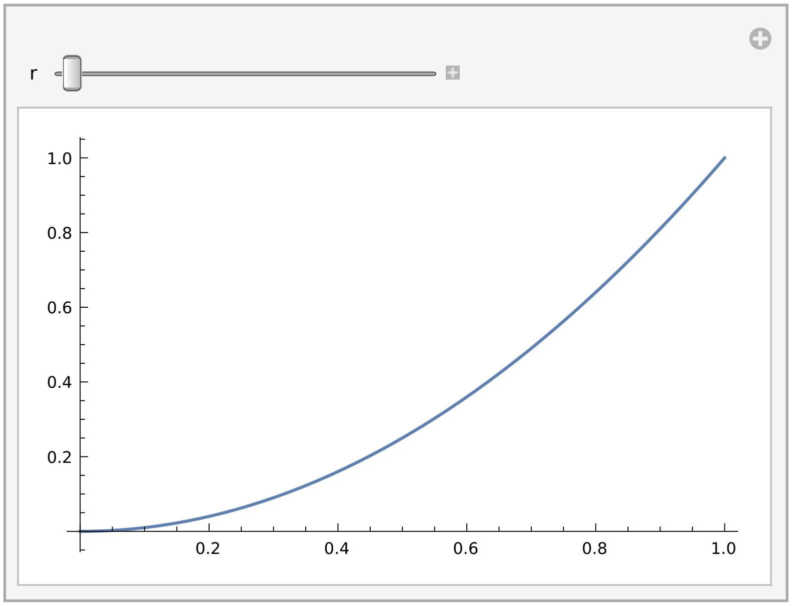
Out[19]=



QUESTION 2: MAKE A MANIPULATE OF A PLOT WHERE THE USER CAN ADJUST THE ASPECTRA-TIO IN REAL TIME FROM STARTING VALUE OF 1/5 TO AN ENDIN GVALUE OF 5. SET IMAGE SIZE TO {AUTOMATIC128} SO THE HEIGHT REMAINS CONSTANT AS THE SLIDEF IS MOVED .

In[20]:=
```
Manipulate[Plot[x^2, {x, 0, r}], {r, 1, 3}, ImageSize → {Automatic128}, AspectRatio → 5/6]
```

Out[20]=



EX: 3.5

QUESTION 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[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}}
```

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) Form a table of the first 100 integers, witgh 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

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

In[2]:=
```
Grid[Partition[Range[100], 20]]
```

Out[2]=

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 command.

In[3]:=
```
Grid[Table[Range[x, x + 19], {x, {1, 21, 41, 61, 81}}]]
```

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

d)Make the same table as above but use only the table command twice. Do not use partition or range.

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

Out[5]=

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: 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[27]:=
```
f[x_] := x ^ 3
Sum[f[x], {x, 1, 20}]
```

Out[28]= 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

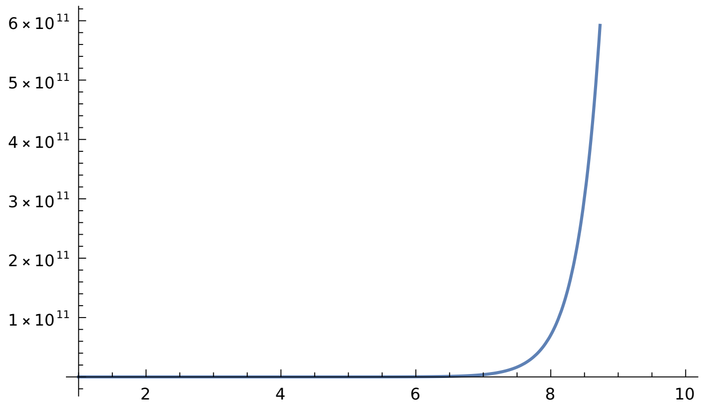
In[29]:=
```
f[x_] := 1 + 2 ^ x + 3 ^ x + 4 ^ x + 5 ^ x + 6 ^ x + 7 ^ x + 8 ^ x + 9 ^ x + 10 ^ x +
   11 ^ x + 12 ^ x + 13 ^ x + 14 ^ x + 15 ^ x + 16 ^ x + 17 ^ x + 18 ^ x + 19 ^ x + 20 ^ x
Table[f[x], {x, 1, 10}]
```

Out[30]=
```
{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[31]:=
```
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
Plot[f[x], {x, 1, 10}]
```

Out[32]=



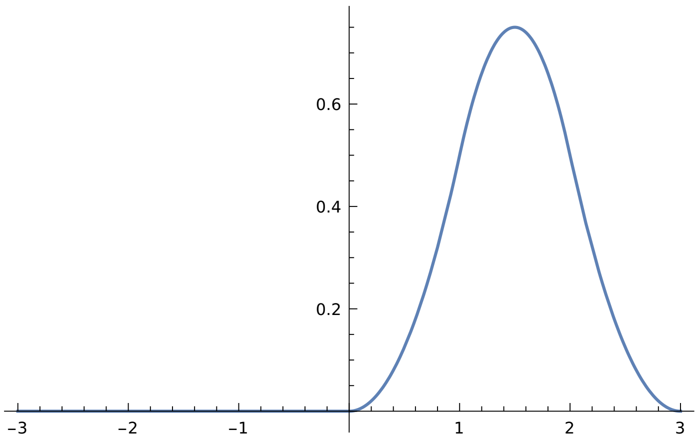
EX:3.6

QUESTION 2: MAKE A PLOT OF APIECEWISE FUNCTION BELOW AND COMMENT ON ITS SHAPE.

ff(x)0{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[39]:=
```
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}}]
Plot[
 f[
  x],
 {x,
  -3,
  3}]
```

Out[40]=



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[35]:=
```
f[x] := Piecewise[{{n ^ 2, n ≤ x ≤ n + 1}, {1, n ≤ x ≤ n + 1}}]
Plot[f[x], {x, 0, 20}]
```

Out[36]=