

ASSIGNMENT

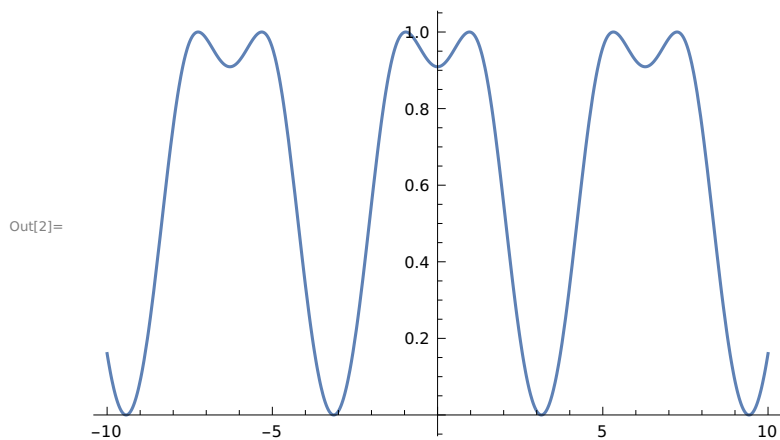
(CHAPTER-3)

EX: 3.2

QUESTION 1: PLOT THE FOLLOWING FUNCTIONS ON THE DOMAIN $-10 \leq x \leq 10$.

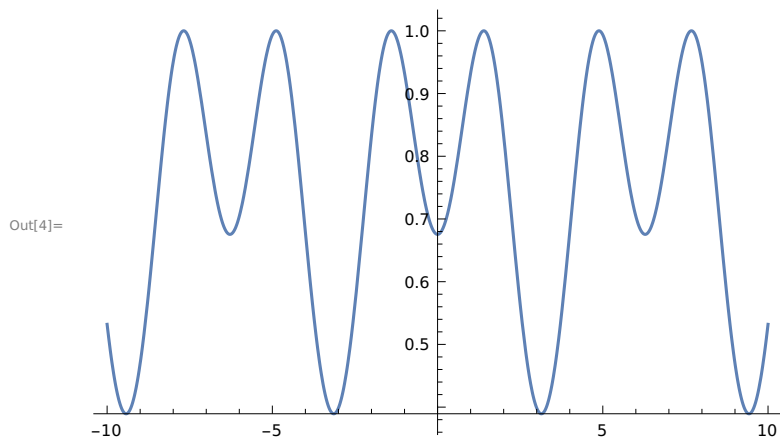
a) $\sin(1+\cos(x))$

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



b) $\sin(1.4+\cos(x))$

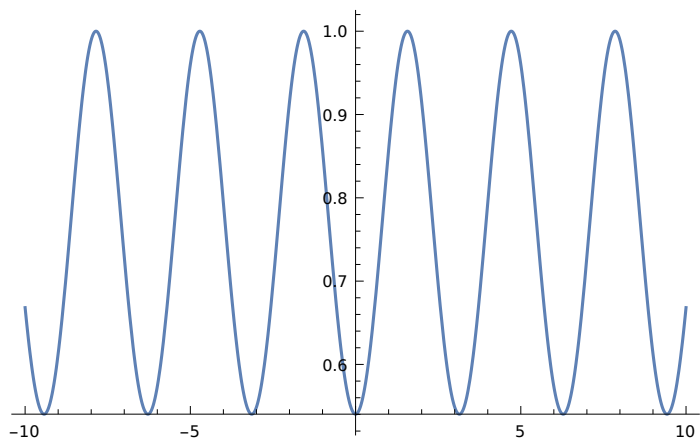
```
In[3]:= g[x_] := Sin[1.4 + Cos[x]]  
Plot[g[x], {x, -10, 10}]
```



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

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

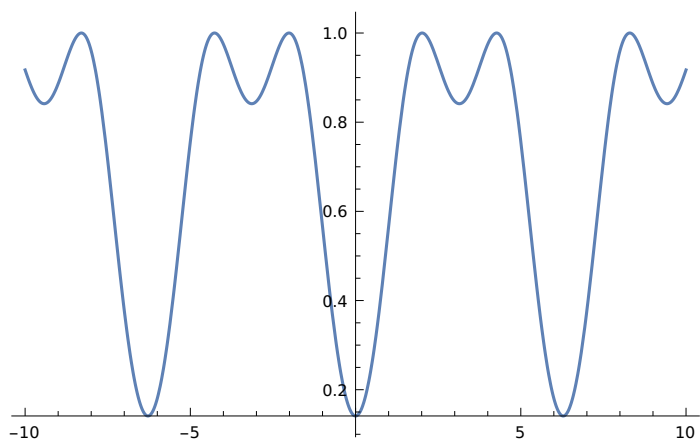
Out[6]=



d) $\sin(2+\cos(x))$

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

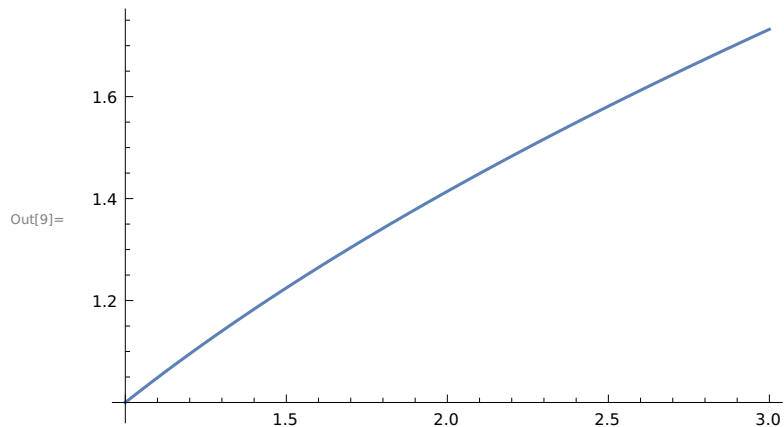
Out[8]=



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

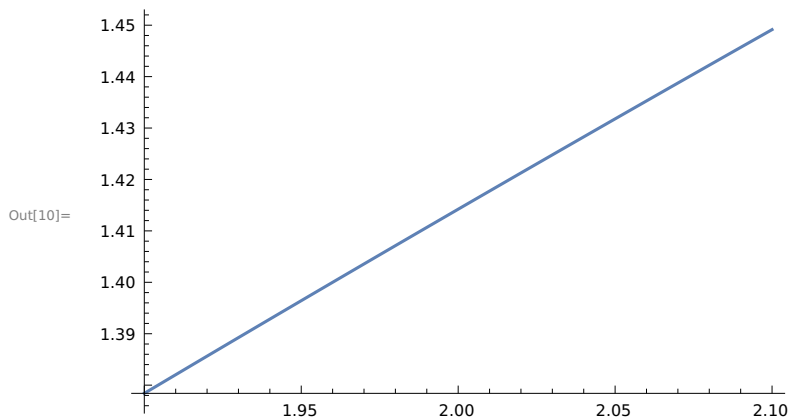
a) Graph of f as x goes from 1 to 3

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

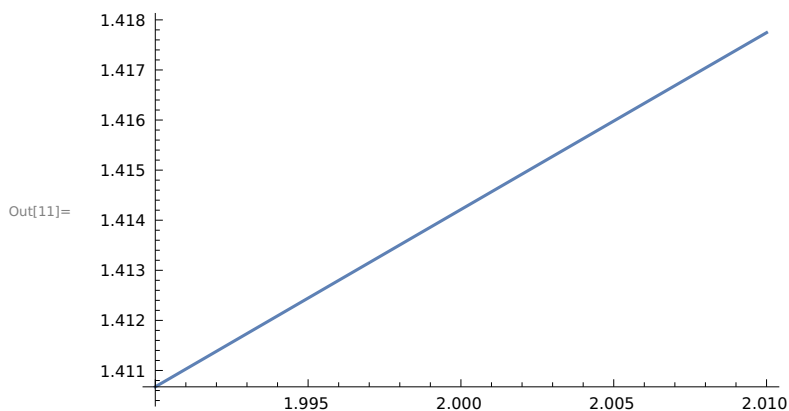


b) Change the value of δ to be $10^{-1}, 10^{-2}, 10^{-3}$ and see the graph of f as x goes from 1.9 to 2.1

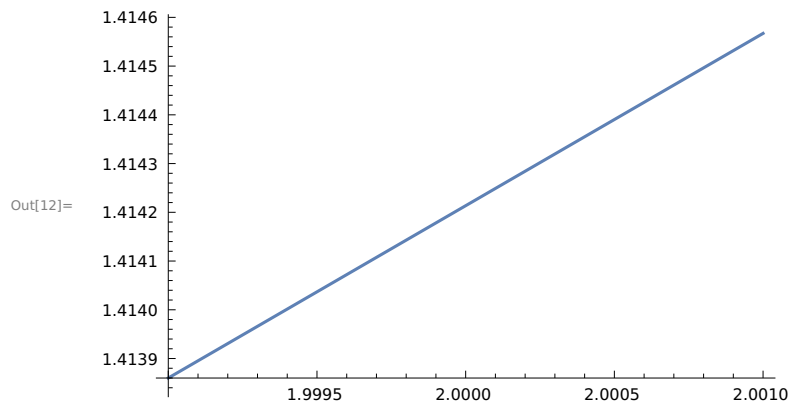
In[10]:= With[{ $\delta = 10^{-1}$ }, Plot[Sqrt[x], {x, 2 - δ , 2 + δ }]



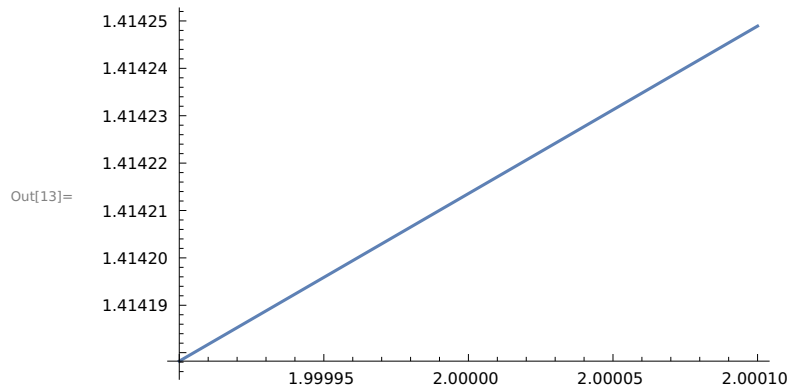
In[11]:= With[{ $\delta = 10^{-2}$ }, Plot[Sqrt[x], {x, 2 - δ , 2 + δ }]



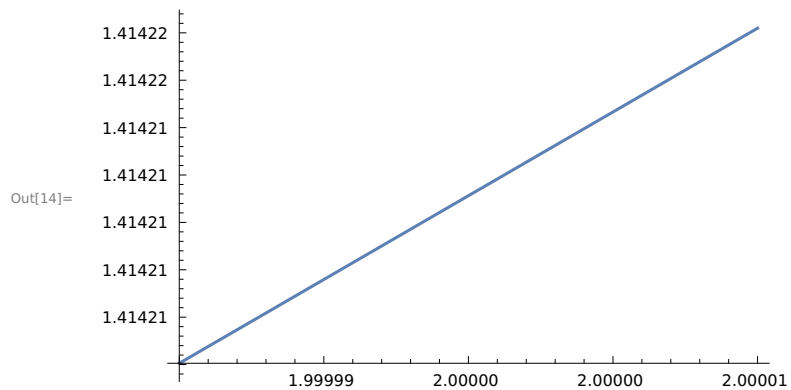
In[12]:= With[{ $\delta = 10^{-3}$ }, Plot[Sqrt[x], {x, 2 - δ , 2 + δ }]



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



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



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 $\sqrt{2} = 1.41421$

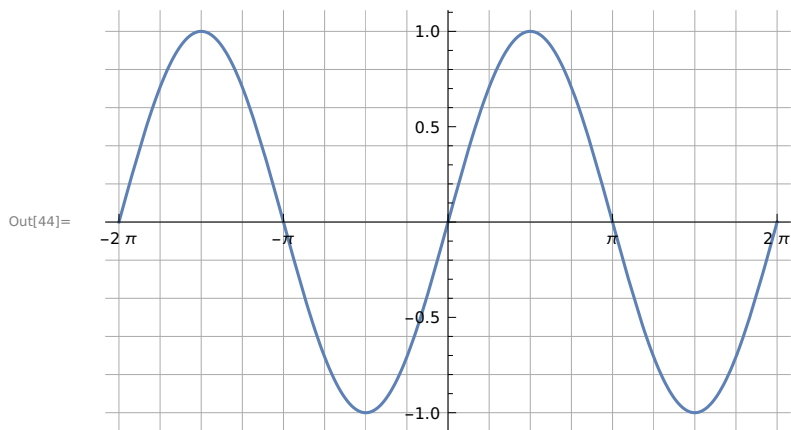
In[15]:= N[$\sqrt{2}$, 6]

Out[15]= 1.41421

EX:3.3

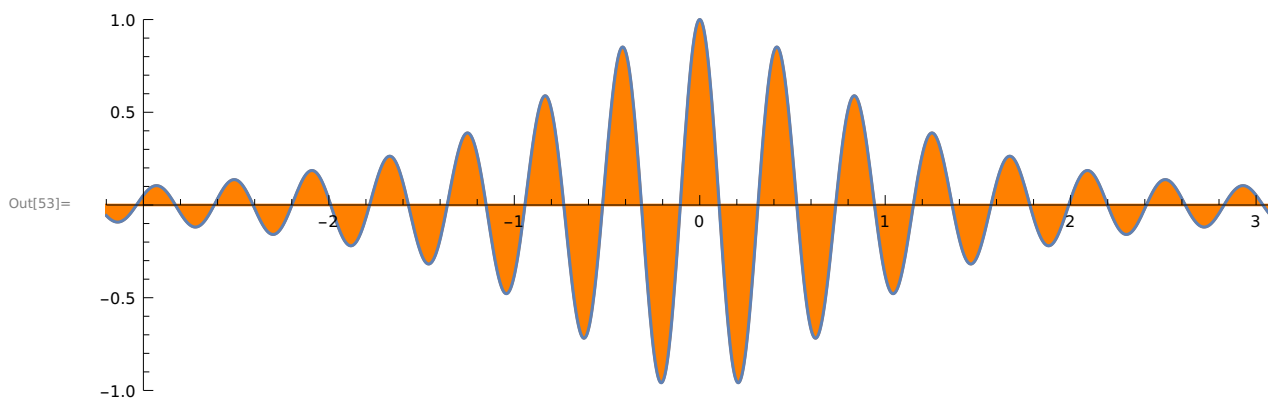
QUESTION 1: USE THE GRIDLINES AND TICK OPTIONS, AS WELL AS THE SETTING GRIDLINESSTYLE→LIGHTER[GRAY] TO PLOT THE SINE FUNCTION.

```
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}]
```



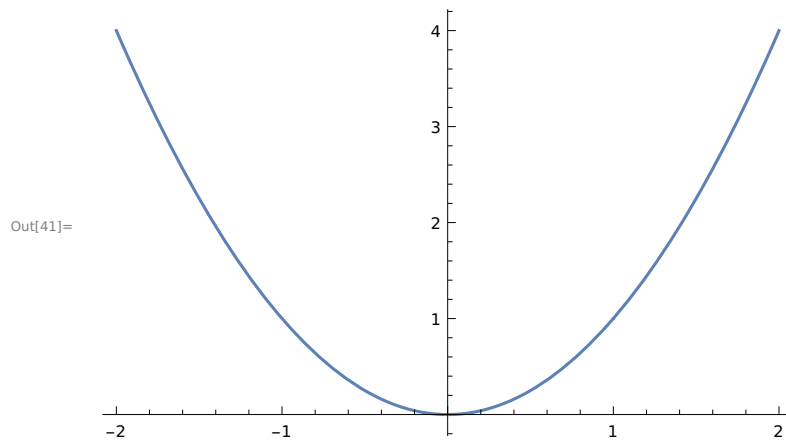
QUESTION 2: USE THE AXES, FRAME, FILLING, FRAMESTYLE, PLOT RANGE AND ASPECTRATIO OPTIONS TO PLOT $Y = \cos(15x)/(1+x^2)$

```
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]
```



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

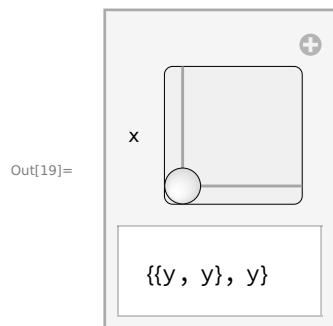
In[41]:= `Plot[x^2, {x, -2, 2}, Exclusions -> {x == 1}]`



EX:3.4

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

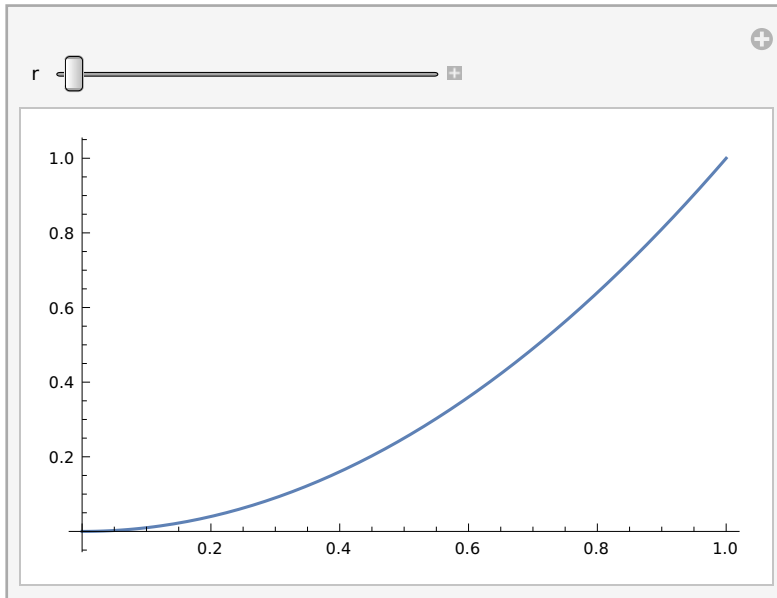
In[19]:= `Manipulate[{x, y}, {x, y, {0, 1}}`



QUESTION 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 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 -> {Automatic, 128}, 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}}

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

```
In[23]:= Table[x, {x, 1, 100}]
Out[23]= {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[24]:= Partition[Table[x, {x, 1, 100}], 20]
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}}
```

c) Make the same table as above, but use only the table and range command.

```
In[25]:= Table[Range[10], 10]
Out[25]= {{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}, {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[26]:= Table[Table[x, {x, 1, 100}]]
Out[26]= {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 $x=1,2,\dots,10$ for the function

$f(x)=1+2^x+3^x+4^x+5^x+6^x+7^x+8^x+9^x+10^x+11^x+12^x+13^x+14^x+15^x+16^x+17^x+18^x$

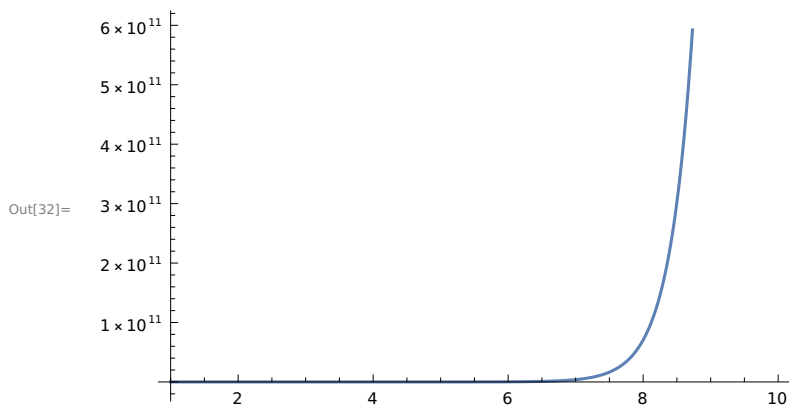
+19^x+20^x

```
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, 44100, 722666, 12333300, 216455810,
          3877286700, 70540730666, 1299155279940, 24163571680850 }
```

c) Plot f(x) on the domain $1 \leq x \leq 10$

```
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}]
```



EX:3.6

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

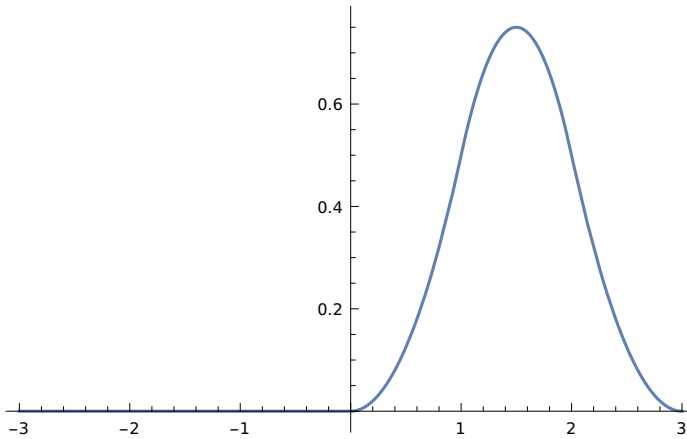
$f(x) = \begin{cases} 0, & x < 0; \\ x^2/2, & 0 \leq x < 1; \\ -x^2 + 3x - 3/2, & 1 \leq x < 2; \\ (1/2)(3-x)^2, & 2 \leq x < 3; \\ 0, & x \geq 3 \end{cases}$	
--	--

```
In[39]:= f[x_] := Piecewise[{{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}}]
```

```
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 $n \leq x < n+1$. USE THE DOMAIN $0 \leq x \leq 20$

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

```
Out[36]=
```

