

MT/19/109.

Jasminder Kaur.

TORRENCE (Chapter-3)

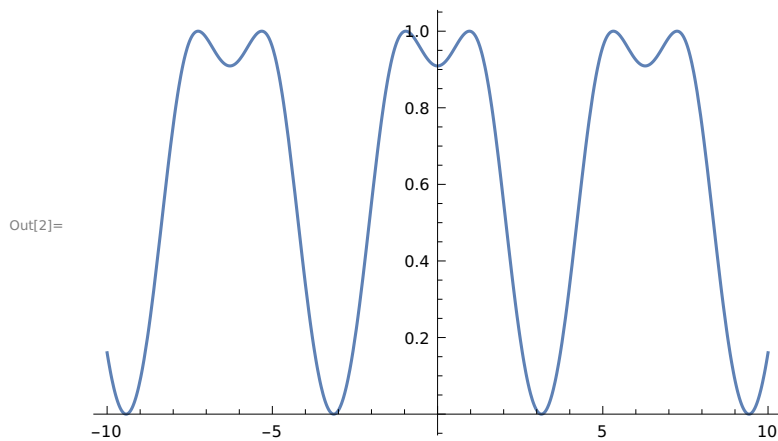
Exercise 3.2

Ques.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]]
```

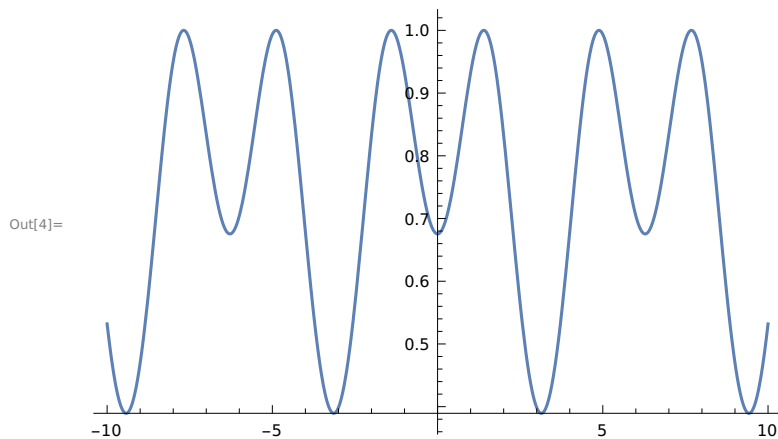
```
In[2]:= Plot[f[x], {x, -10, 10}]
```



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

```
In[3]:= f[x_] := Sin[1.4 + Cos[x]]
```

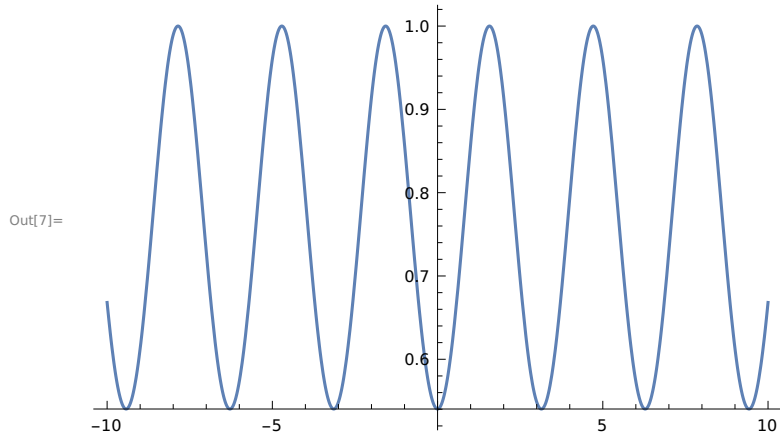
```
In[4]:= Plot[f[x], {x, -10, 10}]
```



c) $\text{Sin}[\text{Pi}/2 + \text{Cos}[x]]$

In[5]:= **f[x_] := Sin[Pi / 2 + Cos[x]]**

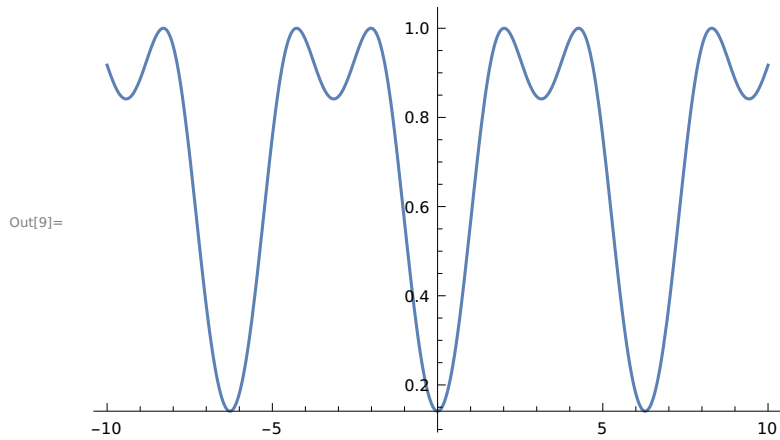
In[7]:= **Plot[f[x], {x, -10, 10}]**



d) $\text{Sin}(2 + \text{Cos}(x))$

In[8]:= **f[x_] := Sin[2 + Cos[x]]**

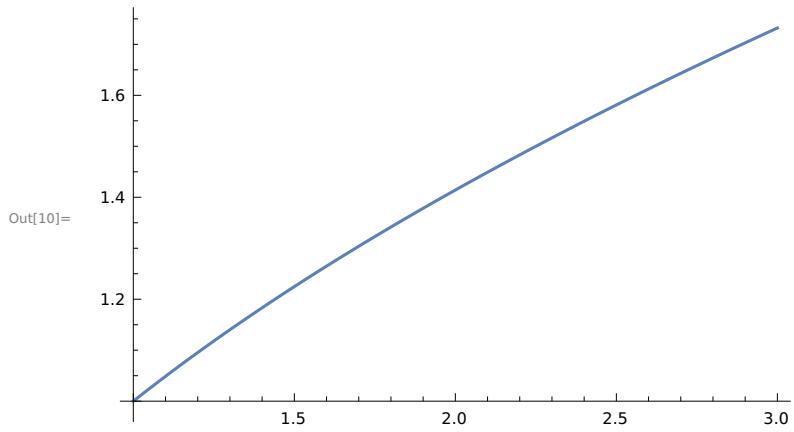
In[9]:= **Plot[f[x], {x, -10, 10}]**



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

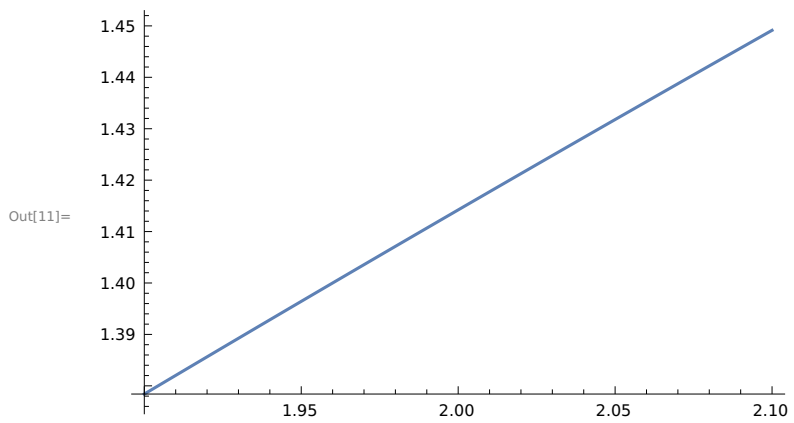
a) Graph of f as x goes from 1 to 3.

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

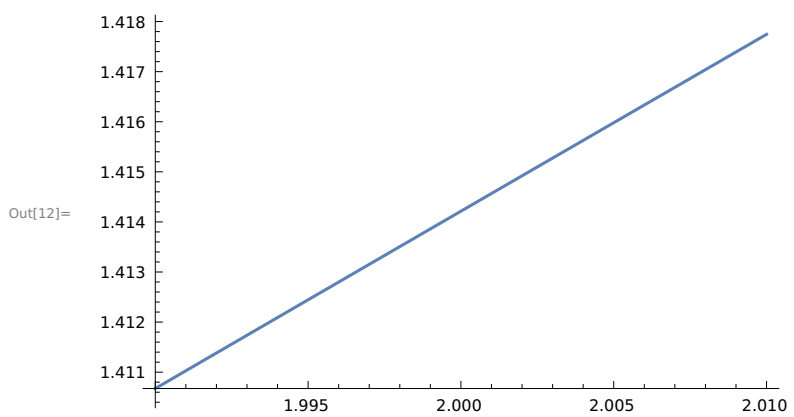


b)

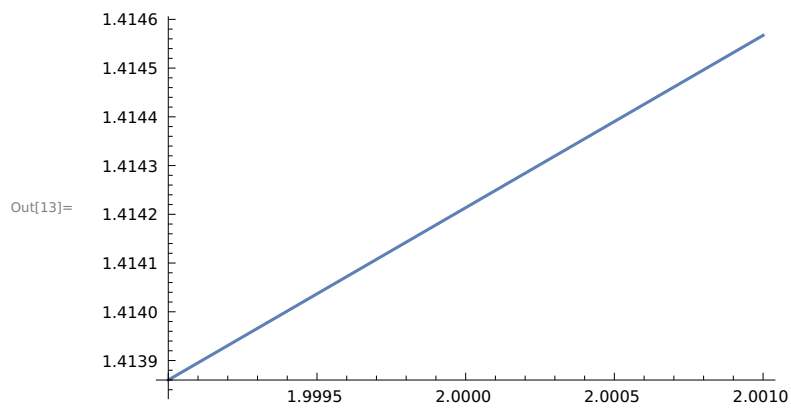
In[11]:= With[{ $\delta = 10^{-1}$ }, Plot[\sqrt{x} , {x, 2 - δ , 2 + δ }]]



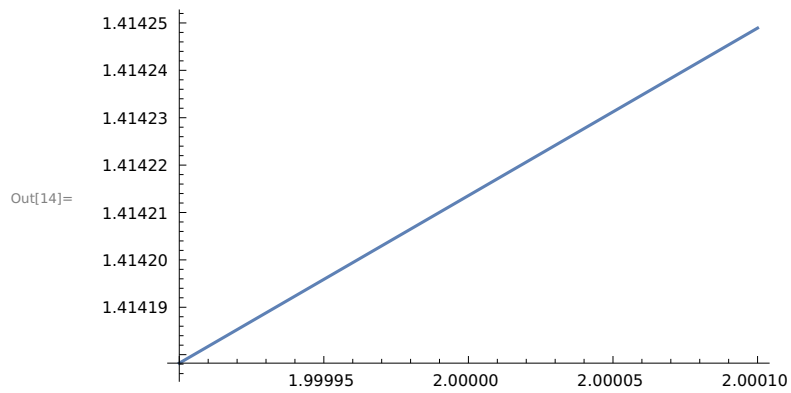
In[12]:= With[{ $\delta = 10^{-2}$ }, Plot[\sqrt{x} , {x, 2 - δ , 2 + δ }]]



```
In[13]:= With[{ $\delta = 10^{-3}$ }, Plot[ $\sqrt{x}$ , {x, 2 -  $\delta$ , 2 +  $\delta$ }]]
```



```
In[14]:= With[{ $\delta = 10^{-4}$ }, Plot[ $\sqrt{x}$ , {x, 2 -  $\delta$ , 2 +  $\delta$ }]]
```



c)

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

Out[15]= 1.41421

In[16]:= **With**[[$\delta = 10^{-20}$], **Plot**[\sqrt{x} , {x, 2 - δ , 2 + δ }]

Plot : Endpoints for x in $\left\{x, \frac{19999999999999999999}{100000000000000000000}, \frac{200000000000000000001}{100000000000000000000}\right\}$ must have distinct machine -precision numerical values .

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

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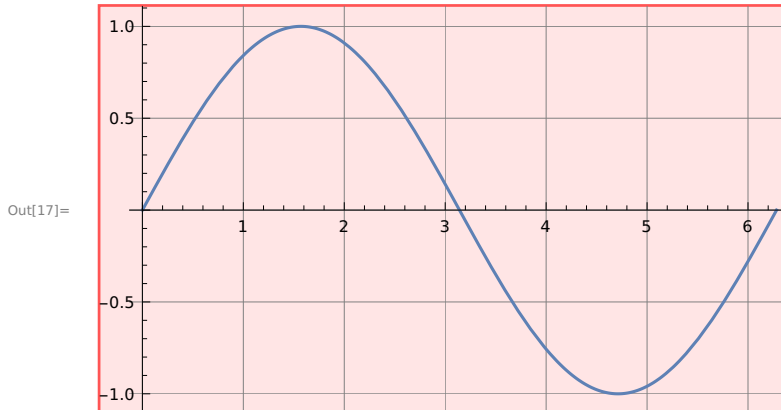
General : Further output of Plot::plld will be suppressed during this calculation .

Out[16]= **Plot**[\sqrt{x} , {x, 2 - $\frac{1}{100\ 000\ 000\ 000\ 000\ 000\ 000}$, 2 + $\frac{1}{100\ 000\ 000\ 000\ 000\ 000\ 000}$ }]

Exercise 3.3

Ques.1

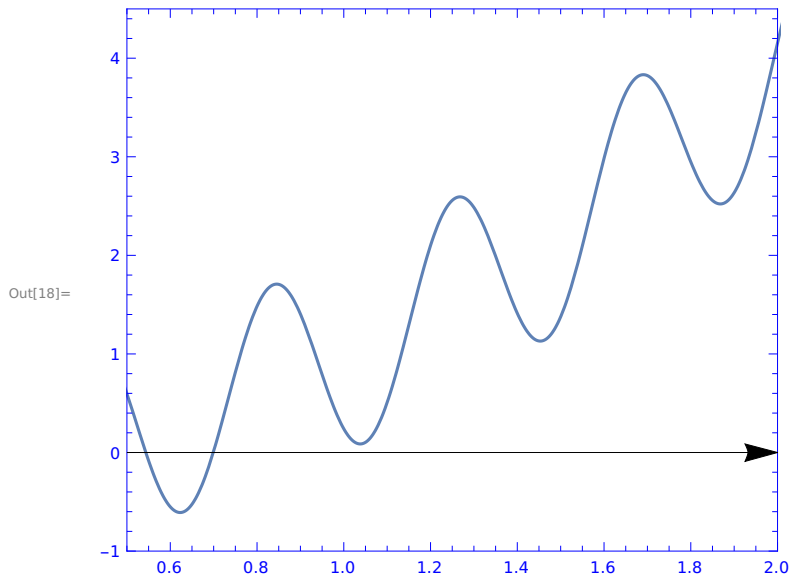
In[17]:= **Plot**[Sin[x], {x, 0, 2 Pi}, **GridLines** → Automatic ,
Ticks → Automatic , **GridLinesStyle** → Light[Gray]]



Ques.2

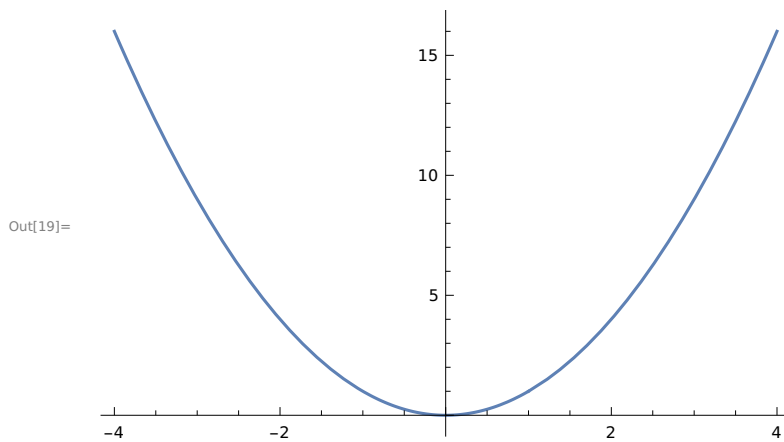
$$\cos(15x)/1+x^2$$

```
In[18]:= Plot[Cos[15 x]/1+x^2, {x, 0, Pi}, PlotRange -> {{0.5, 2}, {-1, 4.5}},
  Frame -> True, AxesStyle -> Arrowheads[00.05], AspectRatio -> 5/6,
  Axes -> True, AxesLabel -> "y=Cos[15x]/1+x^2", FrameStyle -> Blue]
```



Ques.4

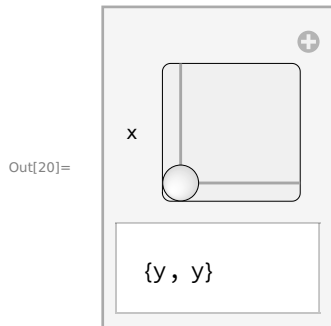
```
In[19]:= Plot[x^2, {x, -4, 4}, Exclusions -> {x == 1}]
```



Exercise 3.4

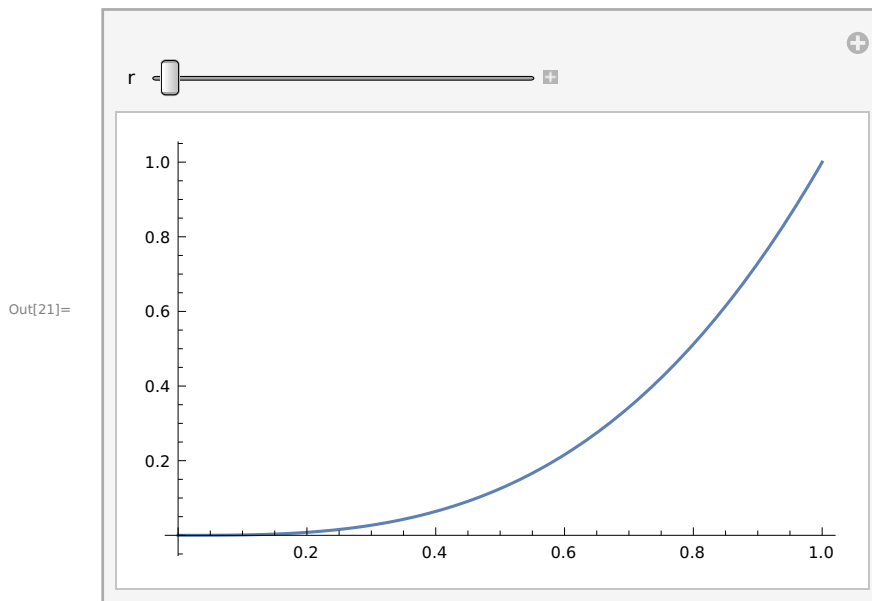
Ques.1

In[20]:= **Manipulate** [{x, y}, {x, y}, {0, 1}]



Ques.2

In[21]:= **Manipulate** [Plot[x^3, {x, 0, r}], {r, 1, 2}, ImageSize -> {Automatic 128}, AspectRatio -> 5/6]



Exercise 3.5

Ques.1 (a)

In[22]:= **Range**[100]

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}

```
In[23]:= Partition[Range[100], 10]
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}}
```

(b)

```
In[25]:= Partition[Table[x, {x, 1, 100}], 20]
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}}

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)

```
In[26]:= Table[Range[10], 10]
Out[26]= {{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)

```
In[27]:= Table[Table[x, {x, 1, 100}]]
Out[27]= {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) Use the sum commands to evaluate the following expressions:

$$1^3+2^3+3^3+4^3+5^3+6^3+7^3+8^3+9^3+10^3+11^3+12^3+13^3+14^3+15^3+16^3+17^3+18^3+19^3+20^3$$

```
In[29]:= f[x_] := x ^ 3
```


In[30]:= **Sum[f[x], {x, 1, 20}]**

Out[30]= 44 100

(b) Make a table of values for $x = 1, 2, \dots, 10$ for the function

$$f(x) =$$

$$1^x + 2^x + 3^x + 4^x + 5^x + 6^x + 7^x + 8^x + 9^x + 10^x + 11^x + 12^x + 13^x + 14^x + 15^x + 16^x + 17^x + 18^x + 19^x + 20^x$$

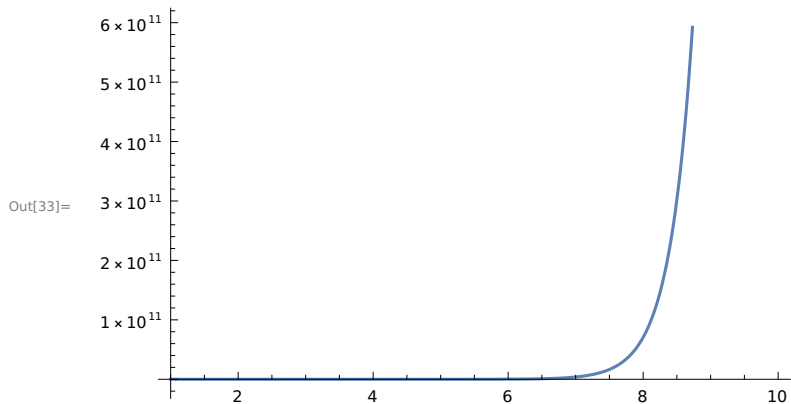
In[31]:= **Table[x^3, {x, 1, 10}]**

Out[31]= {1, 8, 27, 64, 125, 216, 343, 512, 729, 1000}

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

In[32]:= **f[x_] := 1^x + 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[33]:= **Plot[f[x], {x, 1, 10}]**



Exercise 3.6

Ques.3

In[42]:= **f[x_] := n^2**

In[43]:= **Plot[n^2, {x, n, n + 1}, {x, 0, 20}]**

Plot: Options expected (instead of {x, 0, 20}) beyond position 2 in Plot[n², {x, n, n + 1}, {x, 0, 20}]. An option must be a rule or a list of rules.

Out[43]= **Plot[n², {x, n, n + 1}, {x, 0, 20}]**