HIMANI SINGH
MAT/19/4

CHAPTER 3

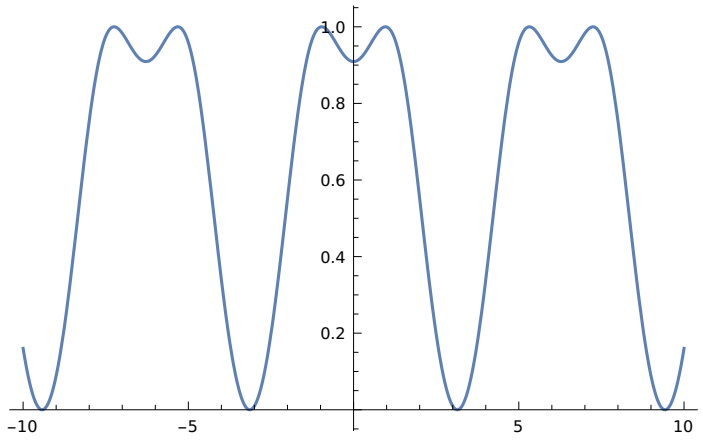
EXERCISE 3.2

QUES 1. Plot the following functions on the domain $-10 \leq x \leq 10$.

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

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

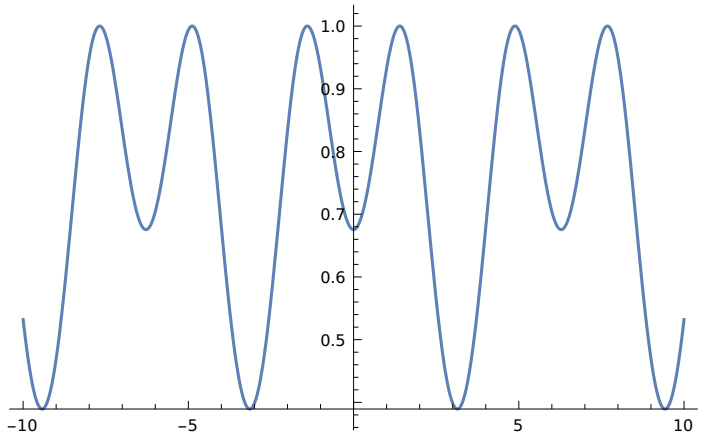
Out[1]=



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

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

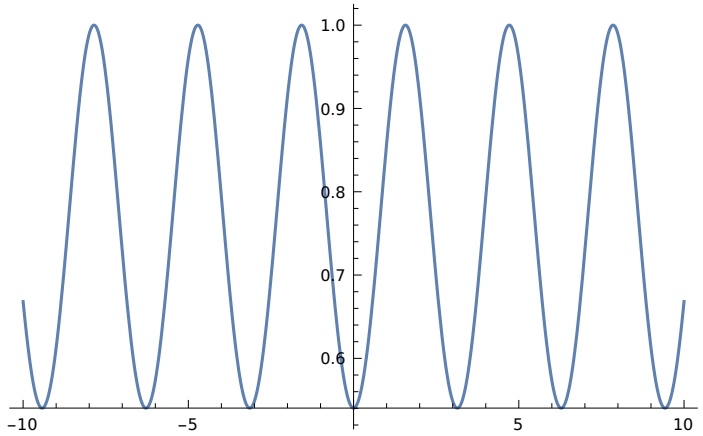
Out[2]=



(c) sin (π / 2 + cos (x))

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

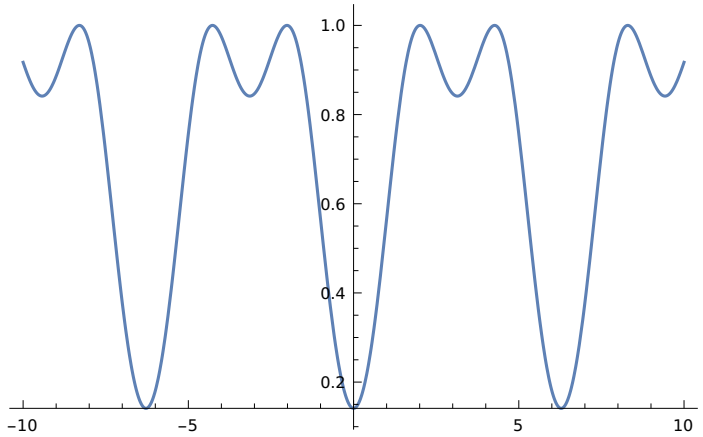
Out[3]=



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

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

Out[4]=

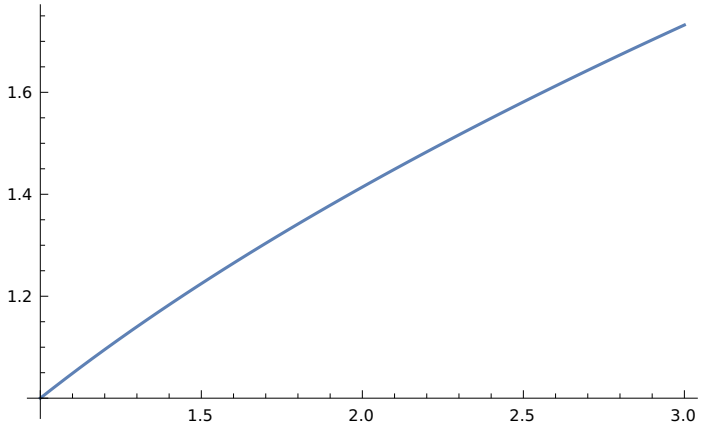


QUES 2.

(a)

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

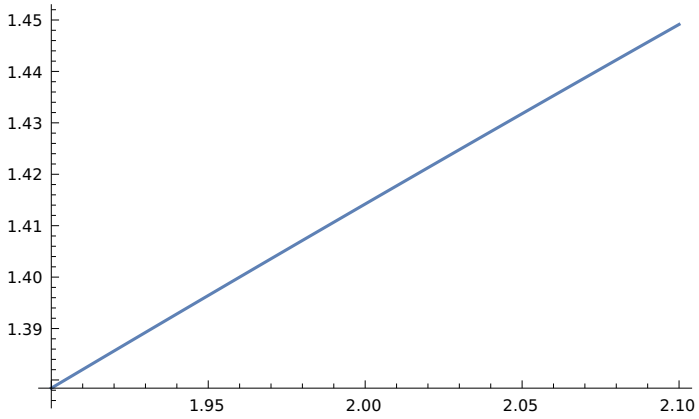
Out[5]=



(b)

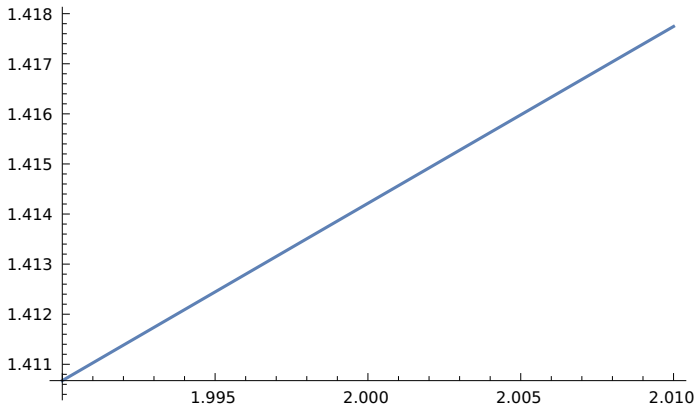
In[6]:=
```
With[{δ = 10^(-1)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[6]=



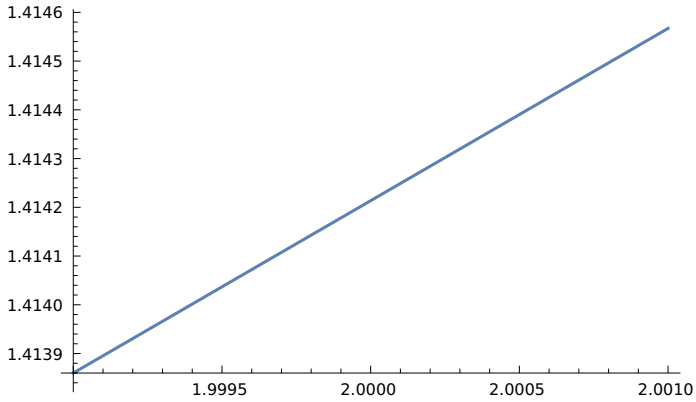
In[7]:=
```
With[{δ = 10^(-2)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[7]=



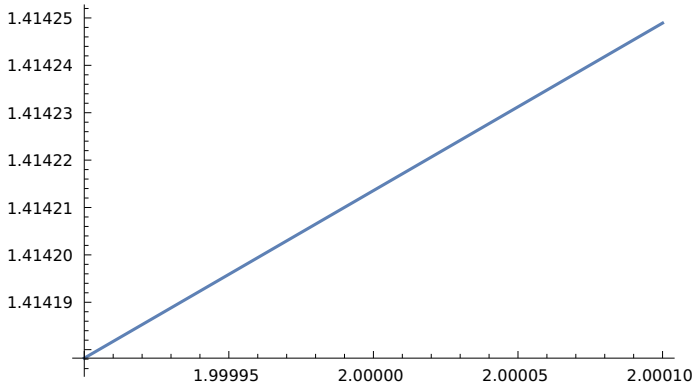
In[8]:=
```
With[{δ = 10^(-3)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[8]=



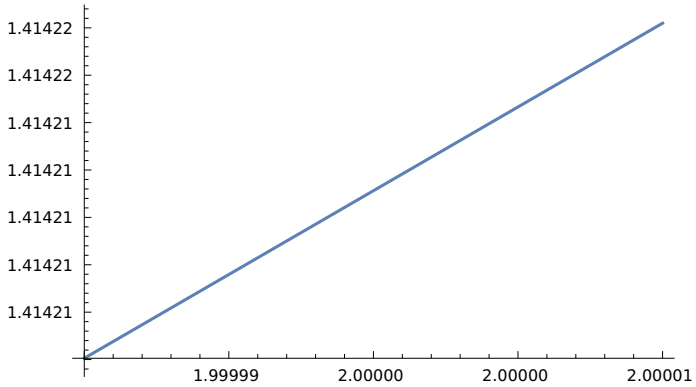
In[9]:=
```
With[{δ = 10^(-4)}, Plot[√x, {x, 2 - δ, 2 + δ}]]
```

Out[9]=



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

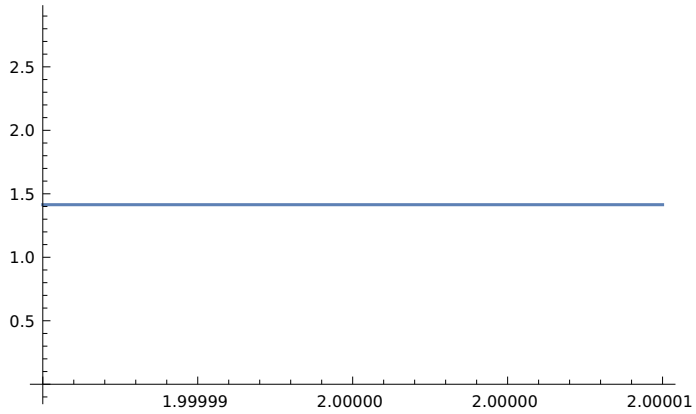
Out[10]=



(c)

In[11]:=
```
With[{δ = 10^(-5)}, Plot[√2, {x, 2 - δ, 2 + δ}]]
```

Out[11]=



In[12]:=
```
f[x_] := N[Sqrt[x], 6]
```

In[13]:=
```
f[2]
```

Out[13]=
```
1.41421
```

(d)

In[14]:=
```
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[14]=
$$\text{Plot}\left[\sqrt{x}, \left\{x, 2 - \frac{1}{100\,000\,000\,000\,000\,000\,000}, 2 + \frac{1}{100\,000\,000\,000\,000\,000\,000}\right\}\right]$$

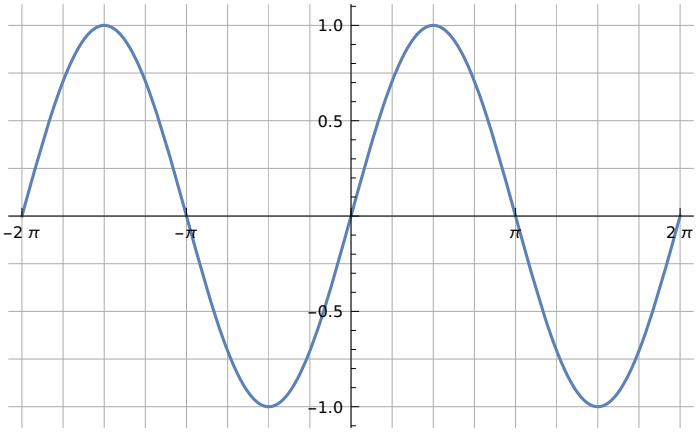
→ The two values i.e, $(2-\delta)$, $(2+\delta)$ and hence their difference is so small that it cannot be read by the computer thus the mathematica is showing error.

EXERCISE 3.3

QUES 1. Use the GridLines and Ticks options, as well as the setting GridLinesStyle → Lighter[Gray], to produce the following Plot of the sine function :

In[15]:=
```
Plot[Sin[x], {x, -2 Pi, 2 Pi}, GridLinesStyle → Lighter[Gray],
 GridLines → {Range[-2 Pi, 2 Pi, Pi/4], Range[-1, 1, 0.25]},
 Ticks → {Range[-2 Pi, 2 Pi, Pi], Automatic}]
```

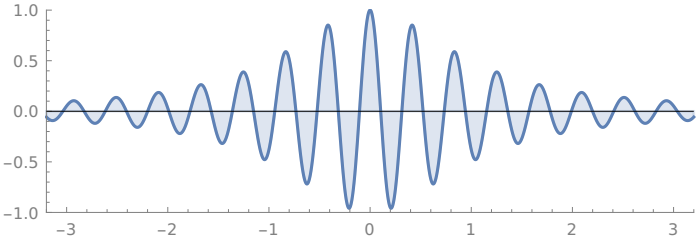
Out[15]=



QUES 2.

In[16]:=
```
Plot[Cos[15 * x]/(1 + x^2), {x, -3.2, 3.2}, AxesOrigin → {-3, 0},
 Axes → {x, y}, Frame → {{True, False}, {True, False}}, FrameStyle → Gray,
 PlotRange → {{-3.2, 3.2}, {-1, 1}}, AspectRatio → Automatic, Filling → Axis]
```

Out[16]=

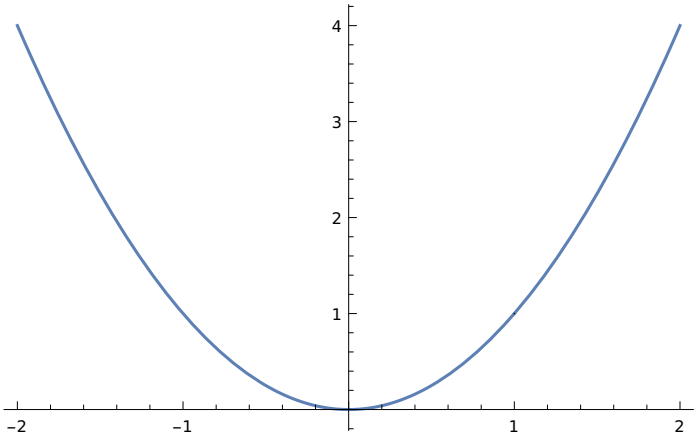


QUES 4.

In[17]:=
```
g[x_] := x^2
```

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

Out[18]=



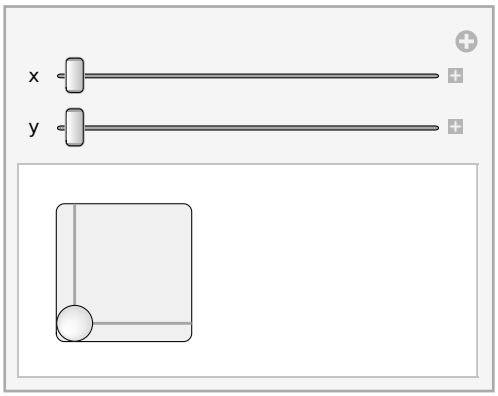
→ There is no vertical asymptote , this shows that the graph is continuous .

EXERCISE 3.4

QUES 1.

In[19]:=
```
Manipulate[Slider2D[{x, y}], {x, 0, 1}, {y, 0, 1}]
```

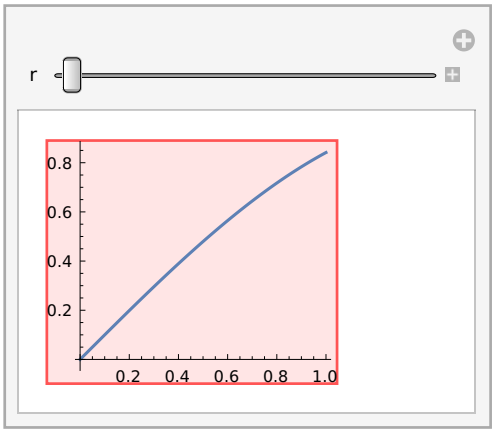
Out[19]=



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

In[20]:=
```
Manipulate[Plot[Sin[x], {x, 0, r},
  AspectRatio → k {k, 1/5, 5}, ImageSize → {Automatic , 128}], {r, 1, 2}]
```

Out[20]=



EXERCISE 3.5

QUES 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 display within a Grid.

(a) Enter the following inputs and discuss the outputs.

Range[100]

Partition[Range[100], 10]

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) Format a table of the first 100 integers ,
with twenty digits per row. The first two 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]:=
```
data = Partition[Range[100], 20]
```

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]:=
```
Grid[data]
```

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 commands . Do not use Partition .

In[25]:=
```
Grid[Table[Range[x, x + 19], {x, {1, 21, 41, 61, 81}}]]
```

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

(d) . Make the same table as above ,
but use only the Table command (twice). Do not use Partition or Range

In[26]:=
```
f[x_] := x
```

In[27]:=
```
Grid[Table[Table[f[x], {x, x, x + 19}], {x, {1, 21, 41, 61, 81}}]]
```

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 2. The Style command is used to apply a particular style to an expression

(a) Enter the following inputs and discuss the outputs .

In[28]:=
```
Style[4, Red]
```

Out[28]= 4

In[29]:=
```
Style[4, 72]
```

Out[29]= 4

In[30]:=
```
Style[4, "Section"]
```

Out[30]= 4

In[31]:=
```
Style[4, FontFamily → "Helvetica", FontWeight → "Bold"]
```

Out[31]= **4**

(b) One can apply a particular style to every item in a Grid by using the entire Grid as the first argument to Style. Create an output that matches that below. The font is Comic Sans MS, and the text should be blue.

1 1 × 1 × 1
2 × 4 × 8 × 16
3 × 9 × 27 × 81
4 × 16 × 64 × 256
5 × 25 × 125 × 625

In[32]:=
```
data = Table[{x, x^2, x^3, x^4}, {x, 1, 5}]
```

Out[32]= {{1, 1, 1, 1}, {2, 4, 8, 16}, {3, 9, 27, 81}, {4, 16, 64, 256}, {5, 25, 125, 625}}

In[33]:=
```
Style[Grid[data], FontFamily → "Comic Sans MS", Blue]
```

Out[33]=

1	1	1	1
2	4	8	16
3	9	27	81
4	16	64	256
5	25	125	625

(c)

In[34]:=
```
Style[Grid[data], Red, 20]
```

Out[34]=

1	1	1	1
2	4	8	16
3	9	27	81
4	16	64	256
5	25	125	625

QUES 3. A statement that is either true or false is called a predicate ; in Mathematica a predicate is any expression that evaluates to True or False . In this exercise you will learn how to use predicates to apply Styles selectively

(a) There are many built – in predicate commands . Most end in the letter Q (for "Query"). Enter the following inputs and discuss the outputs .

In[35]:=
```
? PrimeQ
```

Out[35]=

Symbol

PrimeQ [n] yields True if n is a prime number , and yields False otherwise .

In[36]:=
```
? *Q
```

System`

AcyclicGraphQ	GraphQ	PerfectNumberQ
AlgebraicIntegerQ	GroupElementQ	PermissionsGroupMemberQ
AlgebraicUnitQ	HamiltonianGraphQ	PermutationCyclesQ
AntihermitianMatrixQ	HermitianMatrixQ	PermutationListQ
AntisymmetricMatrixQ	HypergeometricPFQ	PlanarGraphQ
ArgumentCountQ	ImageContainsQ	PointProcessParameterQ
ArrayQ	ImageInstanceQ	PolynomialExpressionQ
AskedQ	ImageQ	PolynomialQ
AssociationQ	IndefiniteMatrixQ	PositiveDefiniteMatrixQ
AtomQ	IndependentEdgeSetQ	PositiveSemidefiniteMatrixQ
AudioInstanceQ	IndependentVertexSetQ	PossibleZeroQ
AudioQ	InexactNumberQ	PrimePowerQ
BinaryImageQ	IntegerQ	PrimeQ
BioSequenceQ	IntersectingQ	PrimitivePolynomialQ
BipartiteGraphQ	IntervalMemberQ	PrintableASCIIQ
BondQ	InverseEllipticNomeQ	ProcessParameterQ

Out[36]=

BooleanQ	IrreduciblePolynomialQ	QHypergeometricPFQ
BoundaryMeshRegionQ	IsomorphicGraphQ	QuadraticIrrationalQ
BoundedRegionQ	KEdgeConnectedGraphQ	QuantityQ
BusinessDayQ	KeyExistsQ	RationalExpressionQ
ByteArrayFormatQ	KeyFreeQ	RegionQ
ByteArrayQ	KeyMemberQ	RegularlySampledQ
ColorQ	KnownUnitQ	RootOfUnityQ
CompatibleUnitQ	KVertexConnectedGraphQ	SameQ
CompleteGraphQ	LeapYearQ	SatisfiableQ
CompositeQ	LegendreQ	ScheduledTaskActiveQ
ConnectedGraphQ	LetterQ	SimpleGraphQ
ConnectedMoleculeQ	LinkConnectedQ	SimplePolygonQ
ConstantRegionQ	LinkReadyQ	SimplePolyhedronQ
ContinuousTimeModelQ	ListQ	SocketReadyQ
ControllableModelQ	LoopFreeGraphQ	SolidRegionQ
ConvexPolygonQ	LowerCaseQ	SpatialObservationRegionQ
ConvexPolyhedronQ	LowerTriangularMatrixQ	SpeakerMatchQ
ConvexRegionQ	MachineNumberQ	SquareFreeQ
CoprimeQ	ManagedLibraryExpressionQ	SquareMatrixQ
DataStructureQ	MandelbrotSetMemberQ	StringContainsQ
DateObjectQ	MarcumQ	StringEndsQ
DateOverlapsQ	MatchLocalNameQ	StringFormatQ
DateWithinQ	MatchQ	StringFreeQ
DaylightQ	MatrixQ	StringMatchQ
DayMatchQ	MemberQ	StringQ
DeviceOpenQ	MersennePrimeExponentQ	StringStartsQ
DiagonalizableMatrixQ	MeshRegionQ	StructuredArrayHeadQ
DiagonalMatrixQ	MissingQ	SubsetQ
DictionaryWordQ	MixedGraphQ	SymmetricMatrixQ
DigitQ	MoleculeContainsQ	SyntaxQ
DirectedGraphQ	MoleculeEquivalentQ	TautologyQ
DirectoryQ	MoleculeQ	TensorQ
DiscreteTimeModelQ	MultigraphQ	TimeObjectQ
DisjointQ	NameQ	TreeGraphQ
DispatchQ	NegativeDefiniteMatrixQ	TrueQ
DistributionParameterQ	NegativeSemidefiniteMatrixQ	UnateQ
DuplicateFreeQ	NormalMatrixQ	UndirectedGraphQ
EdgeCoverQ	NumberQ	UnitaryMatrixQ
EdgeQ	NumericArrayQ	UnsameQ
EdgeTaggedGraphQ	NumericQ	UpperCaseQ

EdgeWeightedGraphQ
EllipticNomeQ
EmptyGraphQ
EulerianGraphQ
EvenQ
ExactNumberQ
FailureQ
FileExistsQ
FileFormatQ
FreeQ
GeoWithinQ
ObservableModelQ
OddQ
OptionQ
OrderedQ
OrthogonalMatrixQ
OutputControllableModelQ
PacletNewerQ
PacletObjectQ
PalindromeQ
PartitionsQ
PathGraphQ
UpperTriangularMatrixQ
ValueQ
VectorQ
VertexCoverQ
VertexQ
VertexWeightedGraphQ
VideoQ
WeaklyConnectedGraphQ
WeightedGraphQ

CloudObject`

CloudDeployActiveQ
UUIDQ

CloudSystem`

FeatureEnabledQ
$CloudContinuousActionQ

JLink`

FrontEndSharedQ
JavaObjectQ
KernelSharedQ
SameObjectQ

MSP`

MSPValueQ

Security`

InsecureExprQ

(b) The If command is used to generate one output if a specified condition (i.e., a predicate) is true, and another if that condition is false. The predicate is the first argument to If. The next argument is what is returned if the predicate is true (If is discussed in Section 8.5). A third argument specifies the expression to be returned if the predicate is false. Enter the following input and discuss the output.

In[37]:=
```
Table[If[PrimeQ[n], Style[n, Red], n], {n, 100}]
```

Out[37]=
```
{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) Format a table of the first 100 integers ,
with ten digits per row. In this table , make all prime numbers red

In[38]:=
```
Partition[Table[If[PrimeQ[n], Style[n, Red], n], {n, 100}], 10]
```

Out[38]=
```
{{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) Format a table of the first 100 integers , with ten digits per row. In this table ,
make all squarefree numbers blue and underlined . Note :
An integer is squarefree if none of its divisors (other than 1) are perfect squares .

In[39]:=
```
Partition[Table[If[SquareFreeQ[n], Style[n, Blue, Underlined], n], {n, 100}], 10]
```

Out[39]=
```
{{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}}
```

(e) . Format a table of the first 100 integers ,
with ten digits per row. In this table , make all prime powers orange
and italicized . Note : An integer is a prime power if it is equal to pn ,
where p is prime and n is a positive integer .

In[40]:=
```
Partition[Table[If[PrimePowerQ[n], Style[n, Orange], n], {n, 100}], 10]
```

Out[40]=
```
{{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. The Sum command has a syntax similar to that of Table .

(a)

In[41]:=
```
Sum[x^3, {x, 1, 20}]
```

Out[41]= 44 100

(b)

In[42]:=
```
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
```

Out[42]= $1 + 2^x + 3^x + 4^x + 5^x + 6^x + 7^x + 8^x + 9^x + 10^x + 11^x + 12^x + 13^x + 14^x + 15^x + 16^x + 17^x + 18^x + 19^x + 20^x$

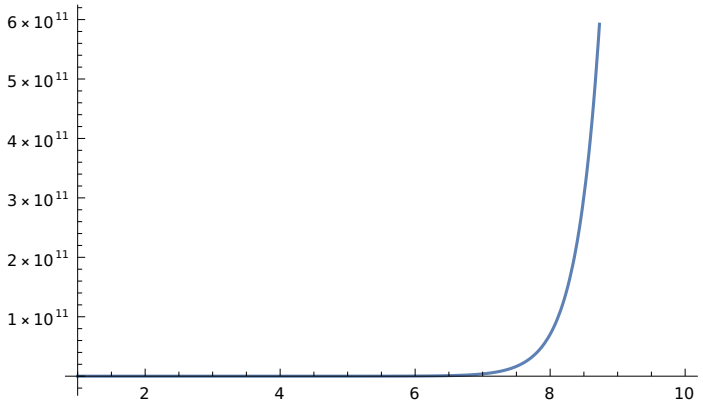
In[43]:=
```
Table[f[x], {x, 1, 10}]
```

Out[43]= {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)

In[44]:=
```
Plot[f[x], {x, 1, 10}]
```

Out[44]=



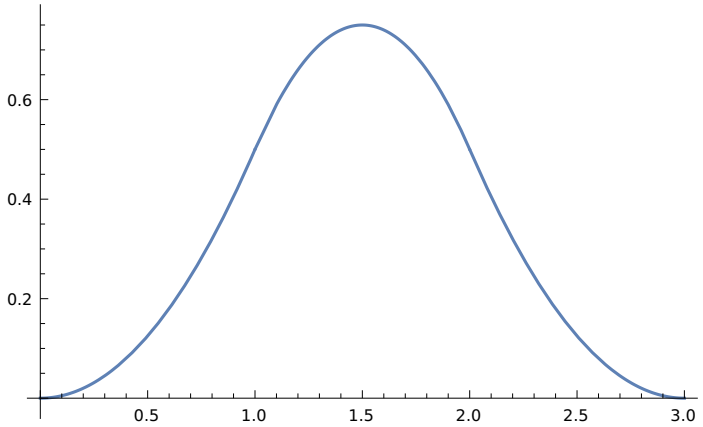
EXERCISE 3.6

QUES 2.

In[45]:=
```
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, 3 ≤ x}}, 1]
```

In[47]:=
```
Plot[f[x], {x, 0, 3}]
```

Out[47]=



QUES 3.

In[48]:=
```
g[x_] := Piecewise[{{0, 0 ≤ x < 1}, {1, 1 ≤ x < 2}, {4, 2 ≤ x < 3},
    {9, 3 ≤ x < 4}, {16, 4 ≤ x < 5}, {25, 5 ≤ x < 6}, {36, 6 ≤ x < 7}, {49, 7 ≤ x < 8},
    {64, 8 ≤ x < 9}, {81, 9 ≤ x < 10}, {100, 10 ≤ x < 11}, {121, 11 ≤ x < 12},
    {144, 12 ≤ x < 13}, {169, 13 ≤ x < 14}, {196, 14 ≤ x < 15}, {225, 15 ≤ x < 16},
    {256, 16 ≤ x < 17}, {289, 17 ≤ x < 18}, {324, 18 ≤ x < 19}, {361, 19 ≤ x < 20}}]
```

In[49]:=
```
Plot[g[x], {x, 0, 20}]
```

Out[49]=