MATHEMATICA PRACTICE

In[1]:= **17 ^ 19 / 19 ^ 17**

Out[1]= $\frac{239\,072\,435\,685\,151\,324\,847\,153}{5\,480\,386\,857\,784\,802\,185\,939}$

In[7]:= **59 875 ^ (1 / 3)**

Out[7]= $5 \times 479^{1/3}$

In[5]:= **17.0 ^ 19 / 19 ^ 17**

Out[5]= 43.6233

In[6]:= **59 875.0 ^ (1 / 3)**

Out[6]= 39.1215

In[8]:= **30.0 / 2**

Out[8]= 15.

In[9]:= **30. / 2**

Out[9]= 15.

In[1]:= **(- 3) ^ 2**

Out[1]= 9

In[2]:= **- 3 ^ 2**

Out[2]= - 9

In[3]:= **(3 + 1) / 2**

Out[3]= 2

In[6]:= **3 + 1 / 2**

Out[6]= $\frac{7}{2}$

In[7]:= **3 + 1. / 2**

Out[7]= 3.5

In[8]:= **25 (2 + 2)**

Out[8]= 100

In[9]:= **25 * (2 + 2)**

Out[9]= 100

In[10]:= **25 * 2 + 25 * 2**

Out[10]= 100

In[11]:= π.

Syntax : "π." is incomplete ; more input is needed .

In[11]:= π+0.

Out[11]= 3.14159

In[13]:= π+e.

Syntax : Incomplete expression ; more input is needed .

In[15]:= i + 0.

Out[15]= 0. + 1. i

In[16]:= Pi = π

Set : Symbol π is Protected .

Out[16]= π

In[1]:= 17 ^ 30

Out[1]= 8 193 465 725 814 765 556 554 001 028 792 218 849

commands in mathematica

1. NUMERICAL APPROXIMATION AND SCIENTIFIC NOTATION ©

In[2]:= N[17 ^ 30]

Out[2]= 8.19347×10^{36}

In[3]:= N[1 / 2 ^ 50]

Out[3]= 8.88178×10^{-16}

In[4]:= N[17 ^ 30 , 20]

Out[4]= $8.1934657258147655566 \times 10^{36}$

In[5]:= N[π , 500]

Out[5]=
```
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899
86280348253421170679821480865132823066470938446095505822317253594081284811174502
84102701938521105559644622948954930381964428810975665933446128475648233786783165
27120190914564856692346034861045432664821339360726024914127372458700660631558817
48815209209628292540917153643678925903600113305305488204665213841469519415116094
33057270365759591953092186117381932611793105118548074462379962749567351885752724
8912279381830119491
```

2. TRIGNOMETRIC FUNCTIONS ©

In[1]:=

```
Cos[π / 4]
```

Out[1]= $\frac{1}{\sqrt{2}}$

In[2]:=

```
Sin[π / 12]
```

Out[2]= $\frac{-1+\sqrt{3}}{2\sqrt{2}}$

In[5]:=

```
ArcSin[(-1 + √3) / 2 √2]
```

Out[5]= $\mathrm{ArcSin}\left[\frac{-1+\sqrt{3}}{\sqrt{2}}\right]$

In[6]:=

```
Tan[π / 12]
```

Out[6]= $2-\sqrt{3}$

In[7]:=

```
Sec[π / 12]
```

Out[7]= $\sqrt{2}\left(-1+\sqrt{3}\right)$

In[8]:=

```
Csc[π / 12]
```

Out[8]= $\sqrt{2}\left(1+\sqrt{3}\right)$

In[9]:=

```
Sin[45 * π / 180]
```

Out[9]= $\frac{1}{\sqrt{2}}$

In[10]:=

```
Sin[45 Degree]
```

Out[10]= $\frac{1}{\sqrt{2}}$

In[11]:=

```
Sin[45 °]
```

Out[11]= $\frac{1}{\sqrt{2}}$

In[12]:=

```
N[π / 180]
```

Out[12]= 0.0174533

In[13]:=

```
N[°]
```

Out[13]= 0.0174533

3. LOGARITHMS

In[3]:=
```
Log[ⅇ]
```
Out[3]= 1

In[4]:=
```
Log[ⅇ^45]
```
Out[4]= 45

In[5]:=
```
N[Log[π], 30]
```
Out[5]= 1.14472988584940017414342735135

In[6]:=
```
Log[10, 1000]
```
Out[6]= 3

In[7]:=
```
Log[2, 512]
```
Out[7]= 9

4. FACTORINTEGER

In[8]:=
```
FactorInteger[4832875]
```
Out[8]= {{5, 3}, {23, 1}, {41, 2}}

In[9]:=
```
5^3*23*41^2
```
Out[9]= 4 832 875

5. FACTOR AND EXPANDING POLYNOMILS

In[10]:=
```
Factor[t^2 - 9]
```
Out[10]= $(-3+t)(3+t)$

In[11]:=
```
Factor[64 - 128 x + 48 x^2 + 144 x^3 - 292 x^4 + 288 x^5 - 171 x^6 + 61 x^7 - 12 x^8 + x^9]
```
Out[11]= $(-2+x)^6\left(1+x+x^3\right)$

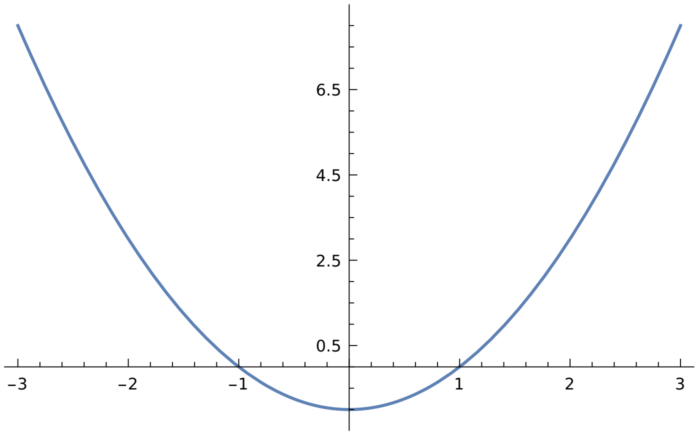
In[13]:=
```
Factor[2 x^2 + 5 x + 3]
```
Out[13]= $(1+x)(3+2x)$

In[14]:=
```
Expand[(-2 + x)^6*(1 + x + x^3)]
```
Out[14]= $64-128x+48x^2+144x^3-292x^4+288x^5-171x^6+61x^7-12x^8+x^9$

6. PLOTTING FUNCTIONS

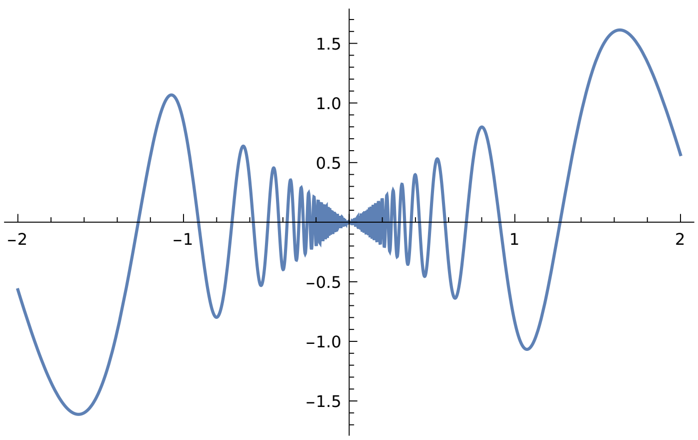
In[15]:=
```
Plot[x ^ 2 - 1, {x, -3, 3}]
```

Out[15]=



In[18]:=
```
Clear[x]
Plot[x * Cos[10 / x], {x, -2, 2}]
```

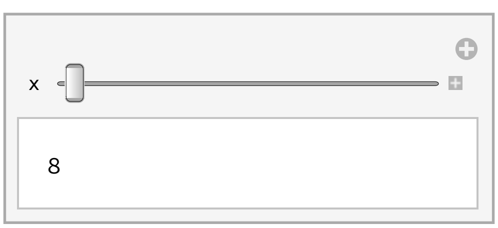
Out[19]=



7. MANIPULATE

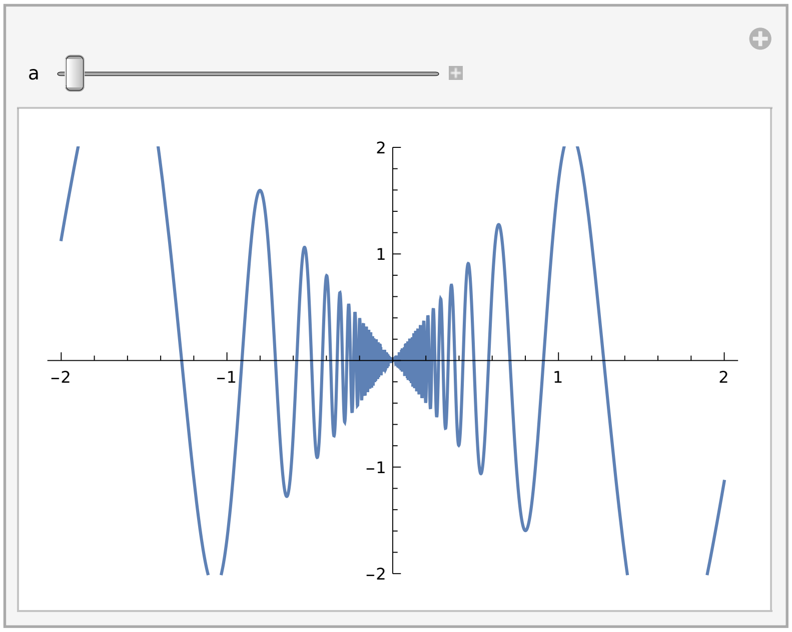
In[1]:=
```
Manipulate[x ^ 2 - 1, {x, -3, 3}]
```

Out[1]=



In[6]:=
```
Clear[x]
Manipulate[Plot[a * x * Cos[10 / x], {x, -2, 2}, PlotRange → 2], {a, -2, 2}]
```

Out[7]=



8. SQUARE ROOT FUNCTION

In[8]:= $\sqrt{144}$

Out[8]= 12

In[9]:=
```
Sqrt[144]
```

Out[9]= 12

9. REAL AND IMAGINARY PARTS OF A COMPLEX NUMBER

In[11]:=
```
Re[2 + 3 i]
```

Out[11]= 2

In[12]:=
```
Im[2 + 3 i]
```

Out[12]= 3

In[13]:=
```
Re[(2 + 3 i) ^ 6]
```

Out[13]= 2035

10. EXTRACTING DIGITS FROM A NUMBER

In[14]:=
```
IntegerDigits[2010]
```

Out[14]= {2, 0, 1, 0}

```
In[15]:= 1 + {2, 0, 1, 0}
Out[15]= {3, 1, 2, 1}

In[16]:= FromDigits[{2, 0, 1, 0}]
Out[16]= 2010

In[17]:= FromDigits[1 + IntegerDigits[2020]]
Out[17]= 3131
```

II. NAMING THINGS

```
In[1]:= θ=π/6
```

Out[1]= $\frac{\pi}{6}$

```
In[2]:= θ
```

Out[2]= $\frac{\pi}{6}$

```
In[3]:= Sin[θ]
```

Out[3]= $\frac{1}{2}$

```
In[4]:= Sin[2 θ]
```

Out[4]= $\frac{\sqrt{3}}{2}$

```
In[5]:= Tan[4 θ]
```

Out[5]= $-\sqrt{3}$

```
Clear[θ]

In[7]:= θ
Out[7]= θ

In[8]:= p = N[π, 40]
Out[8]= 3.141592653589793238462643383279502884197

In[9]:= p * 2 ^ 2
Out[9]= 12.56637061435917295385057353311801153679

In[10]:= Clear[p]
distance = 540 miles
Out[11]= 540 miles
```

```
In[12]:= time = 6 hours
Out[12]= 6 hours

In[13]:= rate = distance / time
```

Out[13]= $\frac{90\ \text{miles}}{\text{hours}}$

```
Clear[distance , time , rate]
```

FUNCTIONS AND THEIR GRAPHS

```
In[2]:= Log[1]
Out[2]= 0

In[10]:= Clear[f]
f[x_] := x ^ 2 + 2 x - 4
f[1]
Out[12]= - 1

In[5]:= f[ π]
```

Out[5]= $-4 + 2\pi + \pi^2$

```
In[9]:= ? f
Out[9]=
Symbol
Global`f
Full Name   Global`f

In[13]:= g[x_] :=  x ^ 3 - 2 x
g[1]
Out[14]= - 1

In[15]:= ? g
Out[15]=
Symbol
Global`g
```

Definitions $g[x\_] := x^3 - 2x$

```
Full Name   Global`g

In[16]:= Clear[g]
```

In[17]:=

```
? g
```

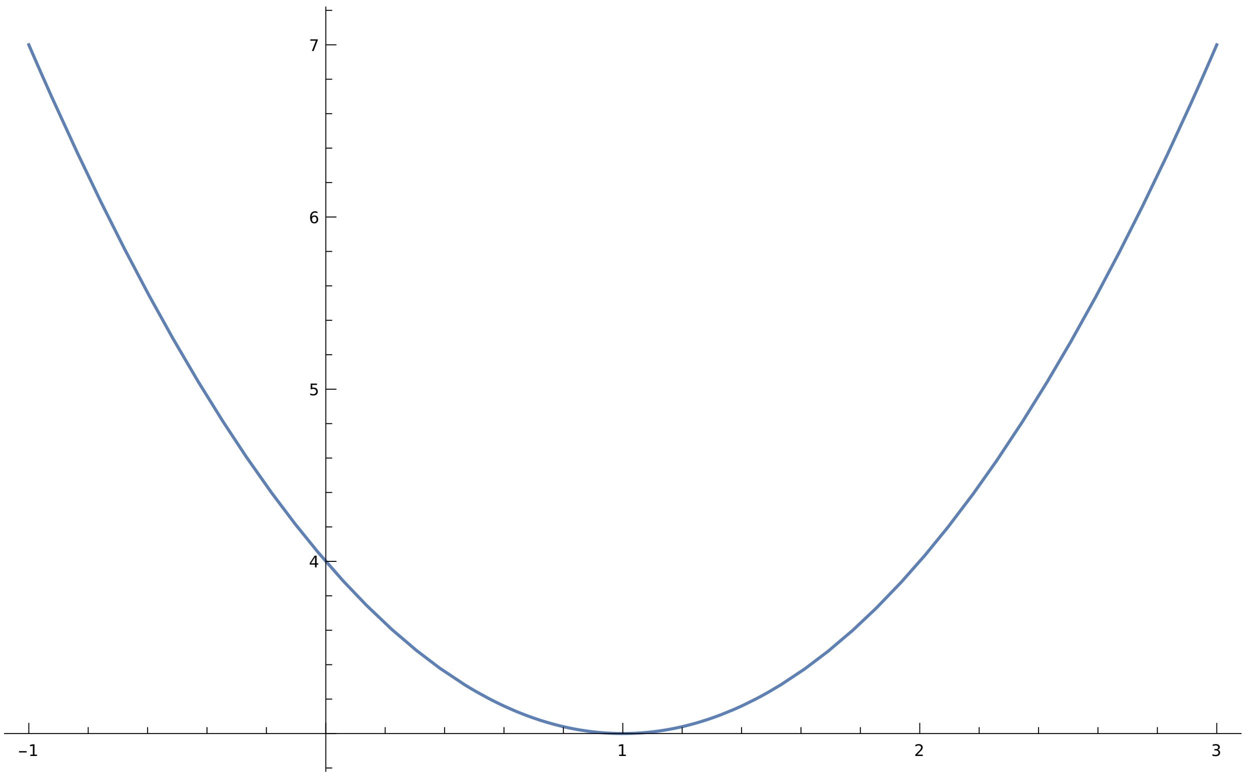
Out[17]=

Symbol	
Global`g	
Full Name	Global`g

In[1]:=

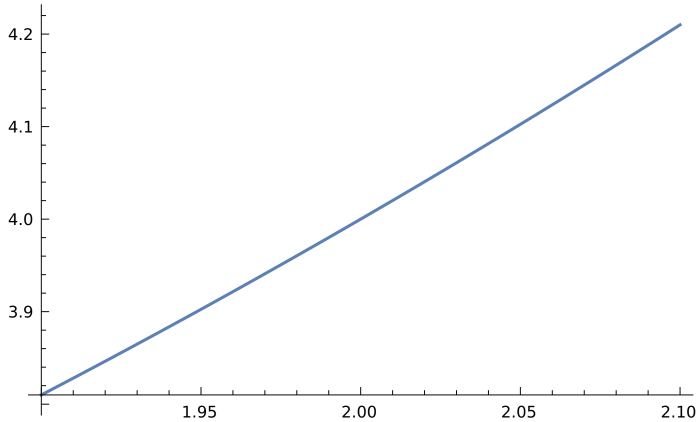
```
Clear[f];
f[x_] := x^2 - 2 x + 4
Plot[f[x], {x, -1, 3}]
```

Out[3]=



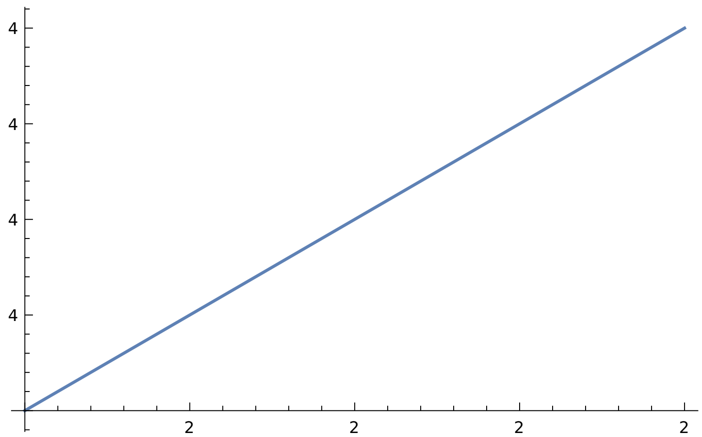
In[4]:= `Plot[f[x], {x, 1.9, 2.1}]`

Out[4]=



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

Out[5]=



In[6]:= `? f`

Out[6]=

Symbol

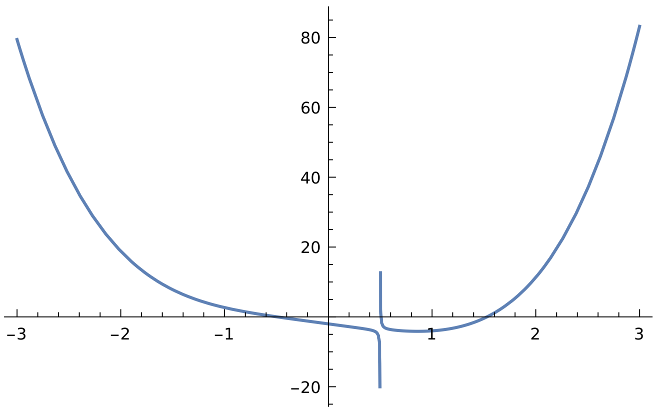
Global`f

Definitions $f[x\_] := x^2 - 2x + 4$

Full Name Global`f

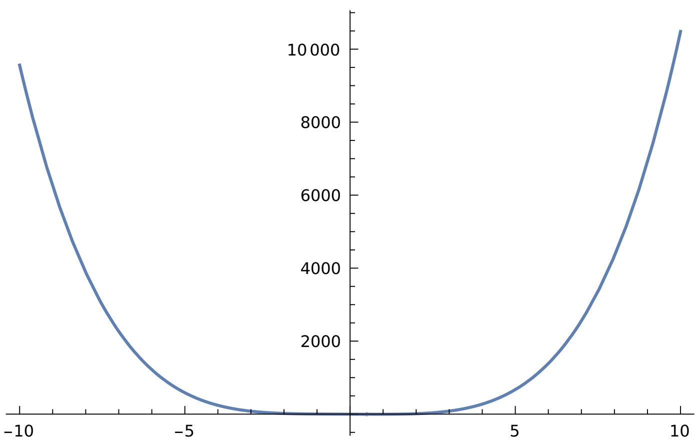
In[7]:=
```
Clear[f];
f[x_] := (x ^ 5 - 4 x ^ 2 + 1) / (x - 1 / 2)
Plot[f[x], {x, -3, 3}]
```

Out[9]=



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

Out[10]=



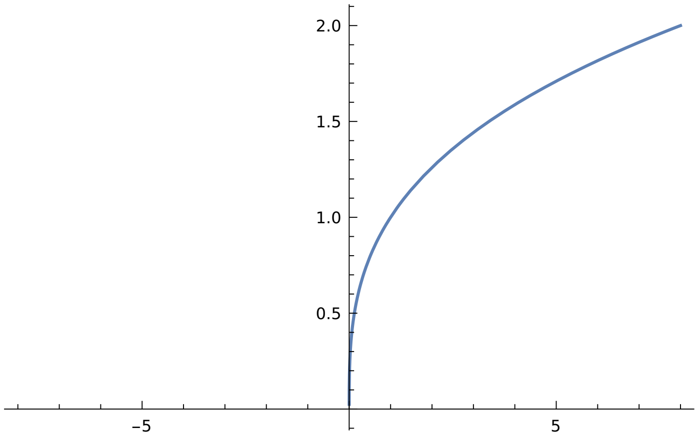
In[11]:=
```
Plot[f[x], {x, -1, 1 / 2, 2}]
```

Plot : Range specification $\left\{x, -1, \frac{1}{2}, 2\right\}$ is not of the form {x, xmin , xmax }.

Out[11]= $\text{Plot}\left[f[x], \left\{x, -1, \frac{1}{2}, 2\right\}\right]$

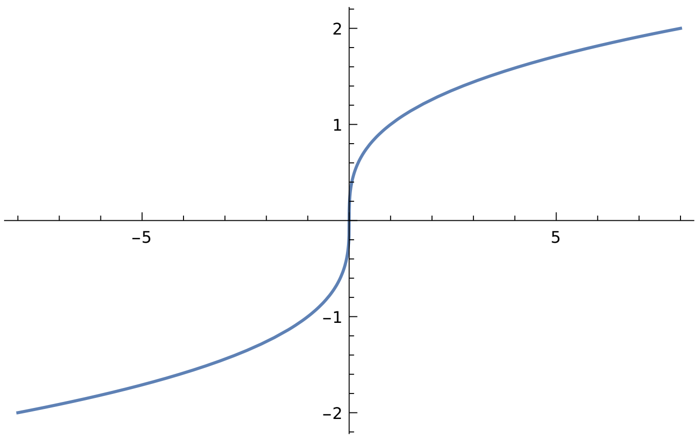
In[13]:= `Plot[x^(1/3), {x, -8, 8}]`

Out[13]=



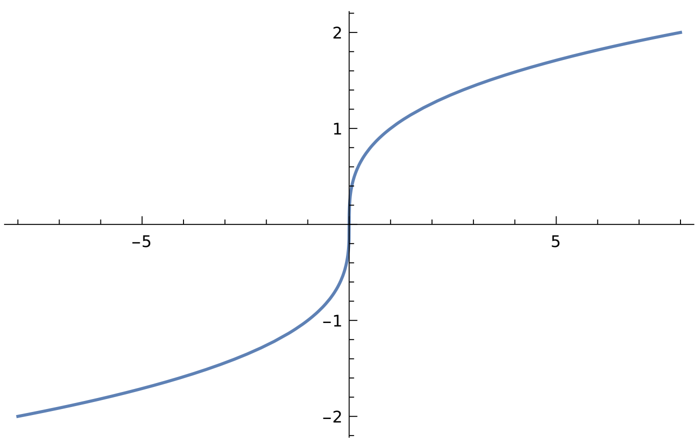
In[14]:= `Plot[CubeRoot[x], {x, -8, 8}]`

Out[14]=



In[16]:= `Plot[Surd[x, 3], {x, -8, 8}]`

Out[16]=



In[17]:=

```
? f
```

Out[17]=

Symbol	
Global`f	
Definitions	$f[x\_] := \frac{x^5-4x^2+1}{x-\frac{1}{2}}$
Full Name	Global`f

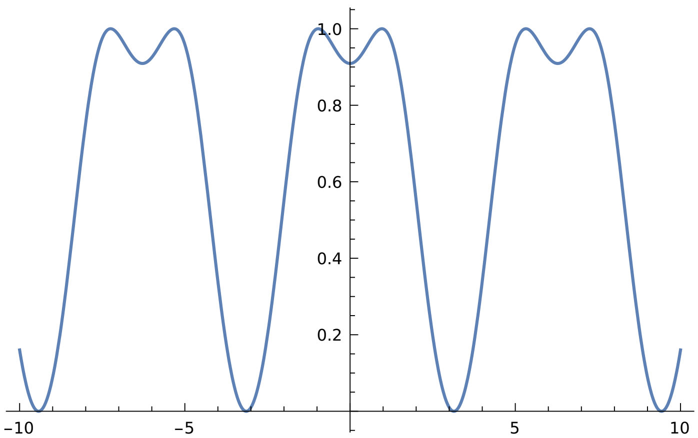
EXERCISE - 3.2

1 (a)

In[18]:=

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

Out[20]=

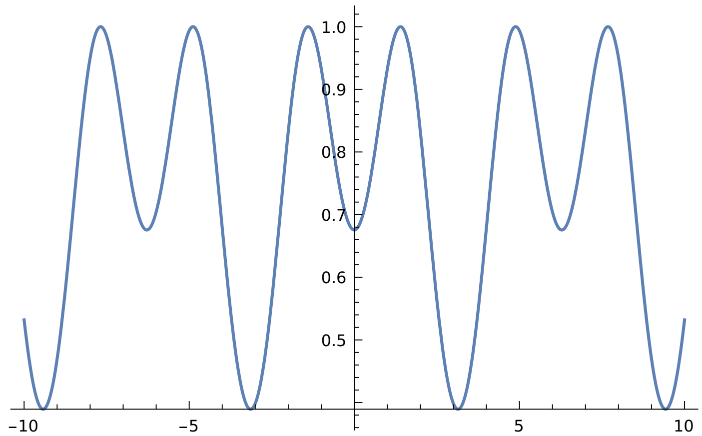


1 (b)

In[21]:=

```
Clear[f];
f[x_] := Sin[1.4 + Cos[x]];
Plot[f[x], {x, -10, 10}]
```

Out[23]=

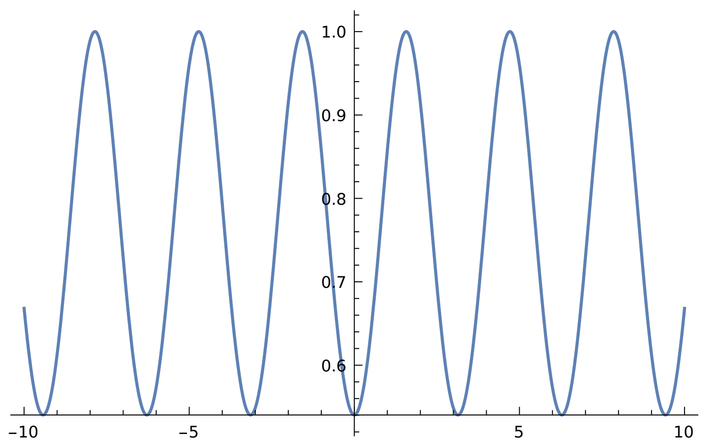


1 (c)

In[24]:=

```
Clear[f];
f[x_] := Sin[ π / 2 + Cos[x]];
Plot[f[x], {x, -10, 10}]
```

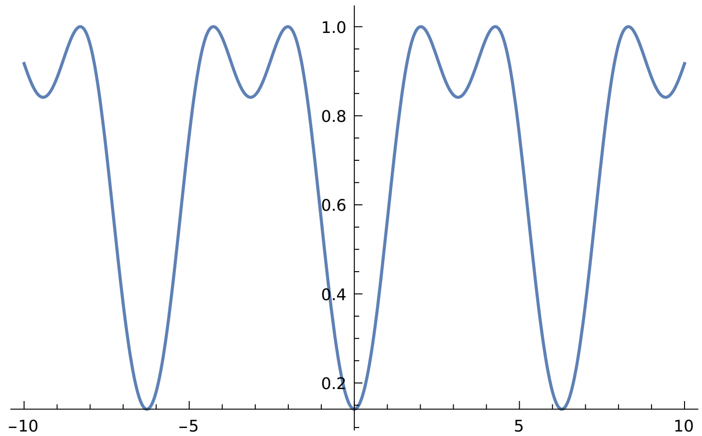
Out[26]=



1 (d)

In[27]:=
```
Clear[f];
f[x_] := Sin[2 + Cos[x]];
Plot[f[x], {x, -10, 10}]
```

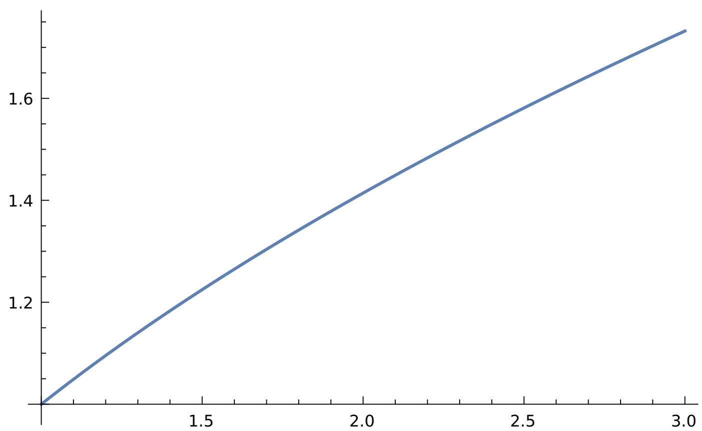
Out[29]=



2 (a)

In[30]:=
```
Clear[f];
f[x_] := Surd[x, 2];
With[{δ = 10^0}, Plot[f[x], {x, 2 - δ, 2 + δ}]]
```

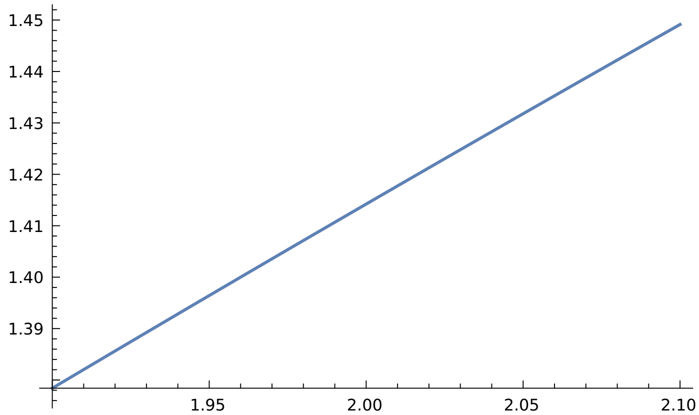
Out[32]=



2 (b)

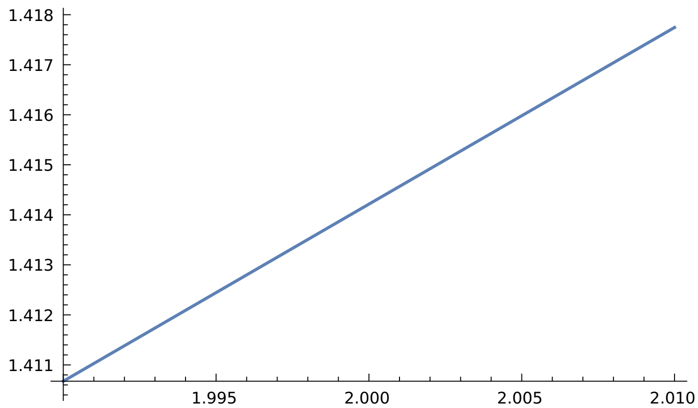
In[33]:= `With[{δ = 10^(-1)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Out[33]=



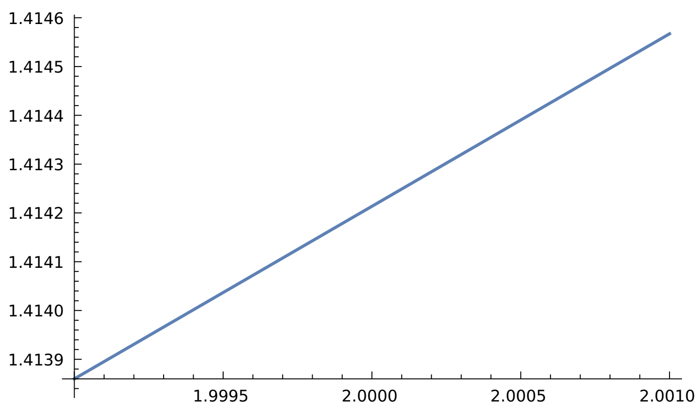
In[34]:= `With[{δ = 10^(-2)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Out[34]=



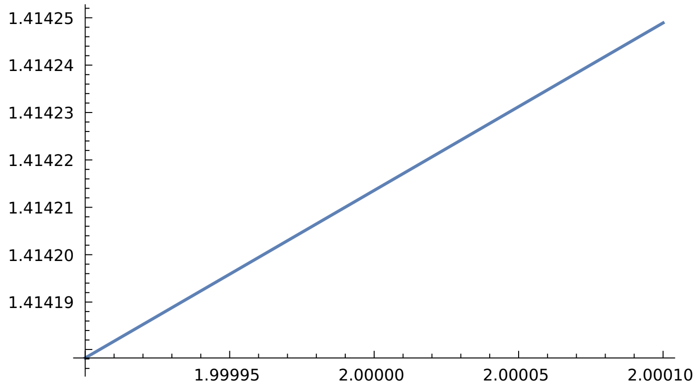
In[35]:= `With[{δ = 10^(-3)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Out[35]=



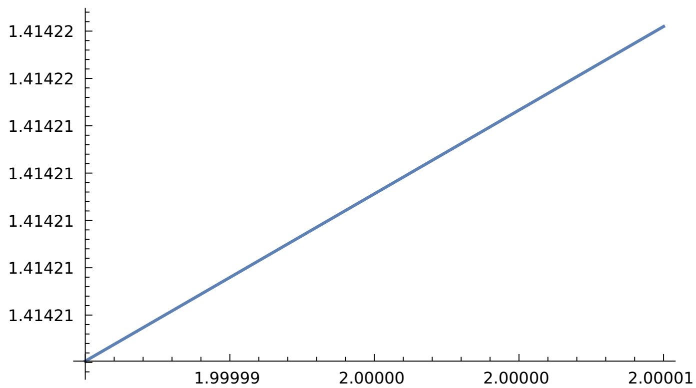
In[36]:= `With[{δ = 10 ^ (-4)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Out[36]=



In[37]:= `With[{δ = 10 ^ (-5)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Out[37]=



2 (c)

In[42]:= `N[f[2], 6]`

Out[42]= 1.41421

In[41]:= `N[√2, 6]`

Out[41]= 1.41421

2 (d)

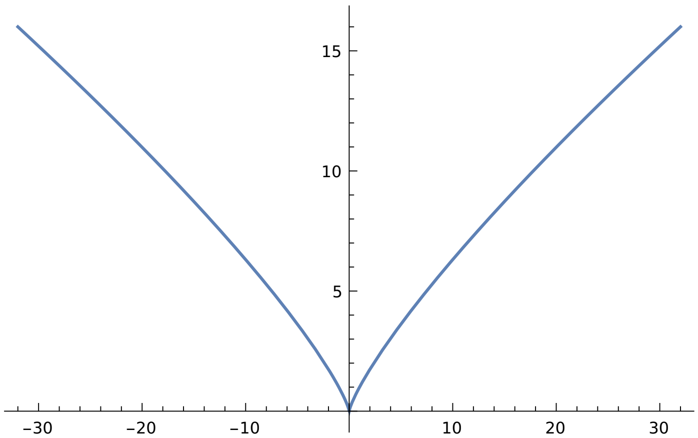
In[43]:= `With[{δ = 10 (^-20)}, Plot[f[x], {x, 2 - δ, 2 + δ}]]`

Syntax : "(" cannot be followed by " ^ −20)".

3

In[43]:=
```
Clear[x];
f[x_] := Surd[x^4, 5];
Plot[f[x], {x, -32, 32}]
```

Out[45]=



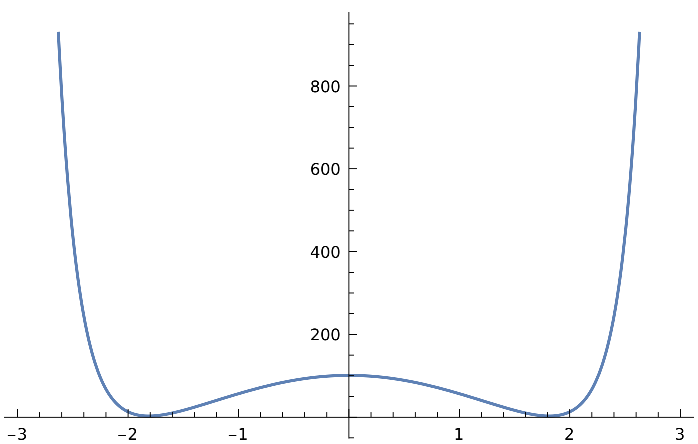
In[46]:=
```
f[32]
```

Out[46]= 16

SECTION 3.3

In[1]:=
```
Clear[f];
f[x_] := 100 * Cos[x] + ⅇ^(x^2);
Plot[f[x], {x, -3, 3}]
```

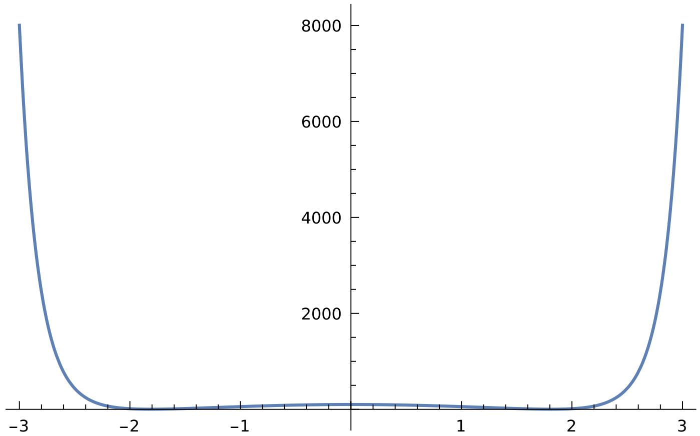
Out[3]=



In[4]:=

```
f[x_] := 100 * Cos[x] + ℯ ^ (x ^ 2);
Plot[f[x], {x, -3, 3}, PlotRange → Full]
```

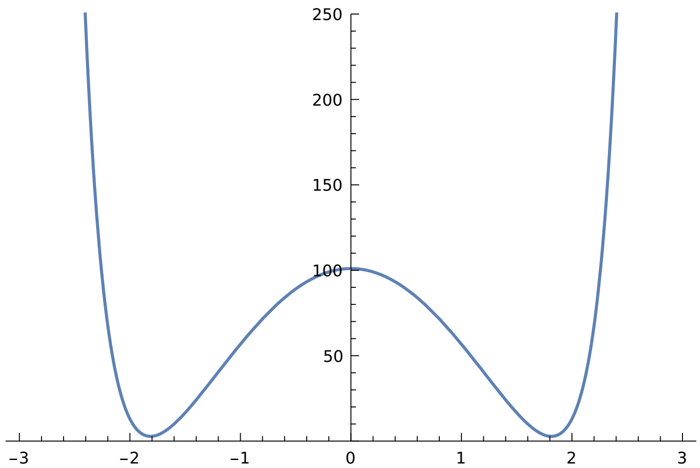
Out[5]=



In[10]:=

```
f[x_] := 100 * Cos[x] + ℯ ^ (x ^ 2);
Plot[f[x], {x, -3, 3}, PlotRange → {0, 250}]
```

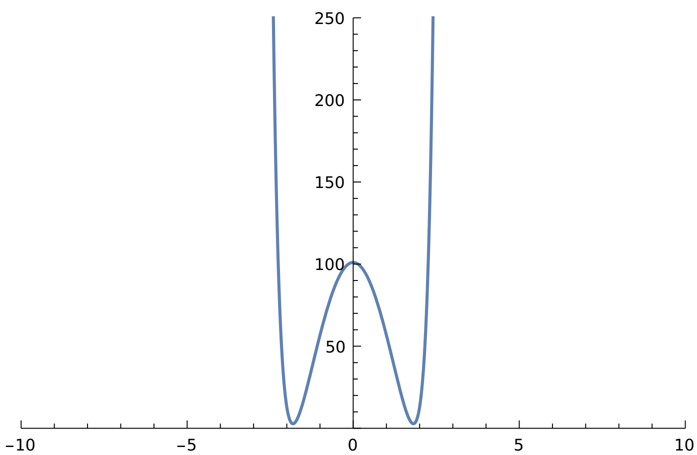
Out[11]=



In[12]:=

```
f[x_] := 100 * Cos[x] + ℯ ^ (x ^ 2);
Plot[f[x], {x, -3, 3}, PlotRange → {{-10, 10}, {0, 250}}]
```

Out[13]=



In[14]:=
```
? f
```

Out[14]=

Symbol

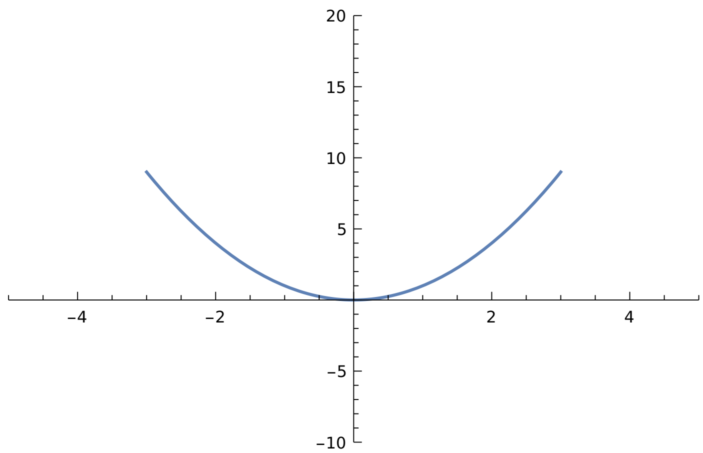
Global`f

Definitions $f[x\_] := 100\ Cos[x] + e^{x^2}$

Full Name Global`f

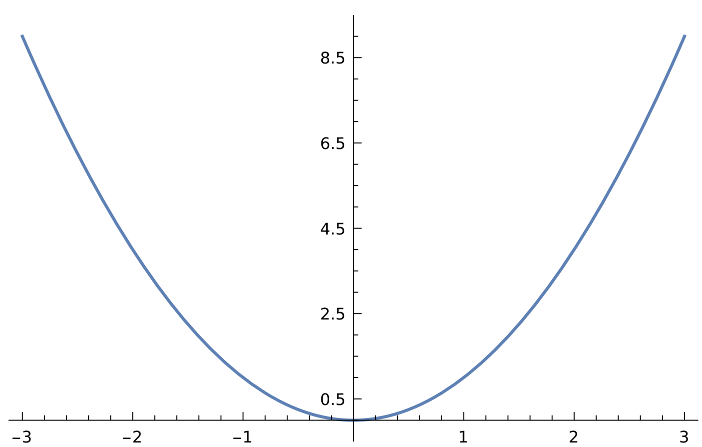
In[27]:=
```
Clear[f];
f[x_] := x^2;
Plot[f[x], {x, -3, 3}, PlotRange → {{-5, 5}, {-10, 20}}]
```

Out[29]=



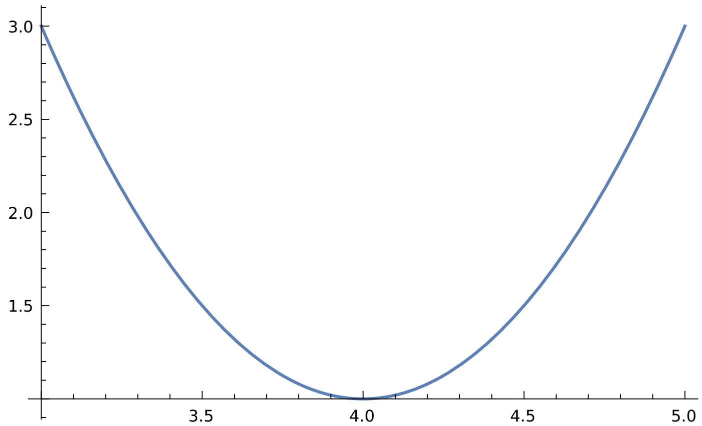
In[30]:=
```
Clear[f];
f[x_] := x^2;
Plot[f[x], {x, -3, 3}, PlotRange → Full]
```

Out[32]=



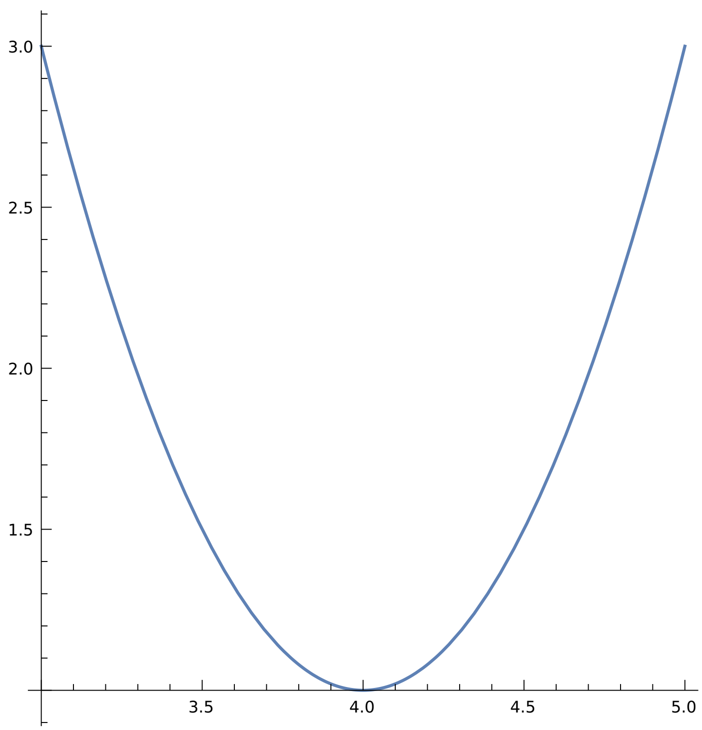
In[33]:=
```
Clear[f];
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}]
```

Out[35]=



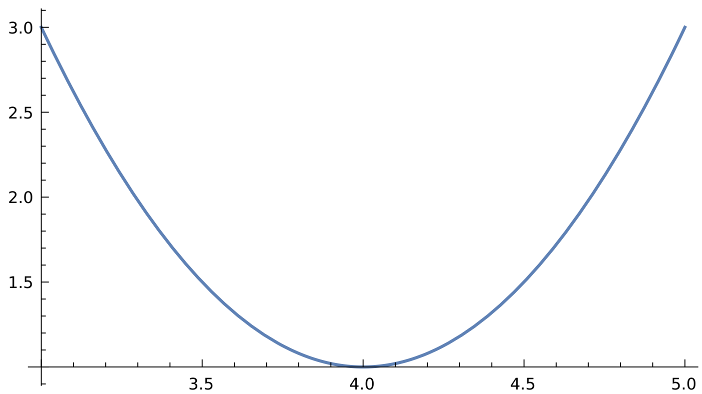
In[36]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, AspectRatio → Automatic]
```

Out[37]=



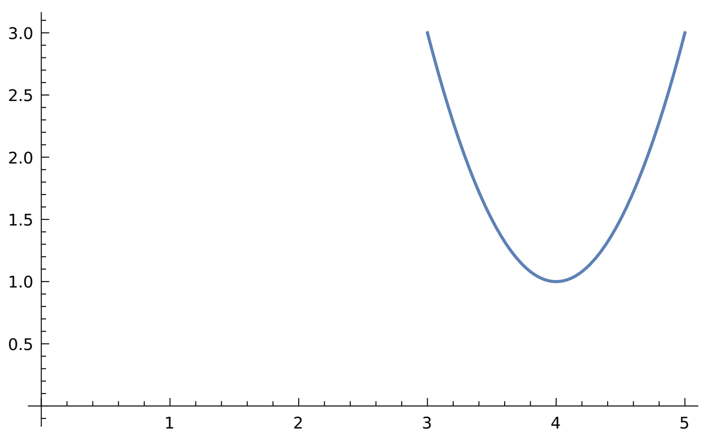
```
In[38]:= f[x_] := 2 (x - 4)^2 + 1;
         Plot[f[x], {x, 3, 5}, AspectRatio → 9 / 16]
```

Out[39]=



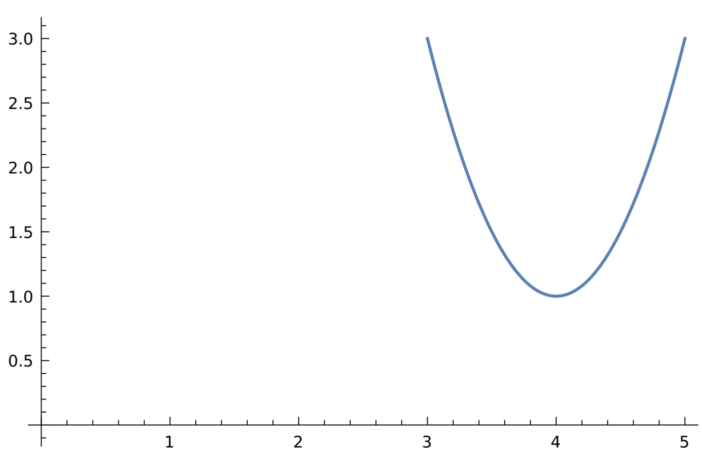
```
In[44]:= f[x_] := 2 (x - 4)^2 + 1;
         Plot[f[x], {x, 3, 5}, AxesOrigin → {0, 0}]
```

Out[45]=



```
In[46]:= f[x_] := 2 (x - 4)^2 + 1;
         Plot[f[x], {x, 3, 5}, AxesOrigin → {0, 0}, AspectRatio → Automatic]
```

Out[47]=



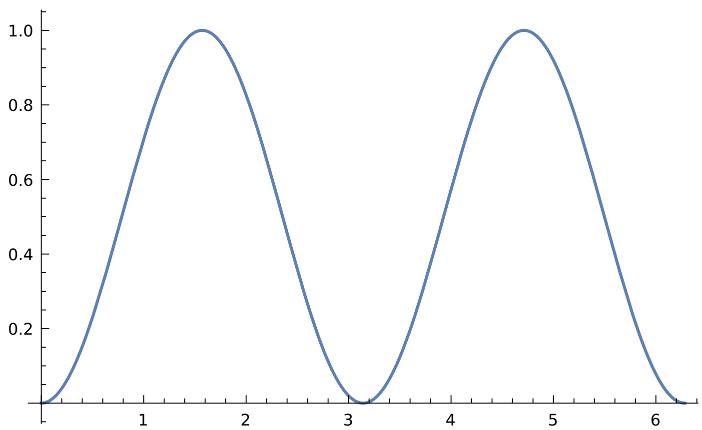
In[48]:=
```
? f
```

Out[48]=

Symbol	
Global`f	
Definitions	$f[x\_] := 2\,(x-4)^2 + 1$
Full Name	Global`f

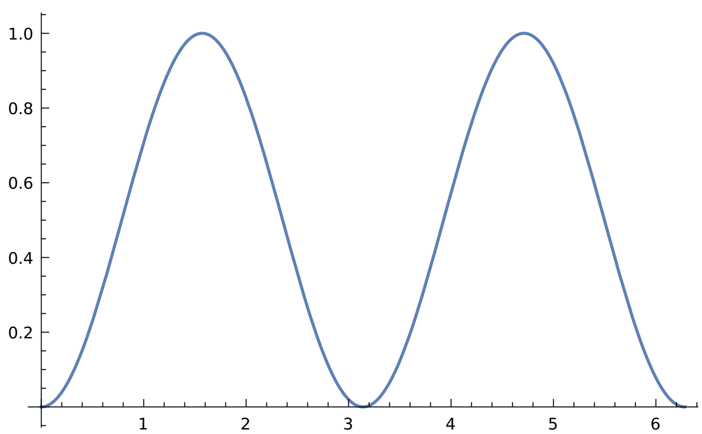
In[49]:=
```
Clear[f];
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}]
```

Out[51]=



In[52]:=
```
Plot[(Sin[x])^2, {x, 0, 2 π}]
```

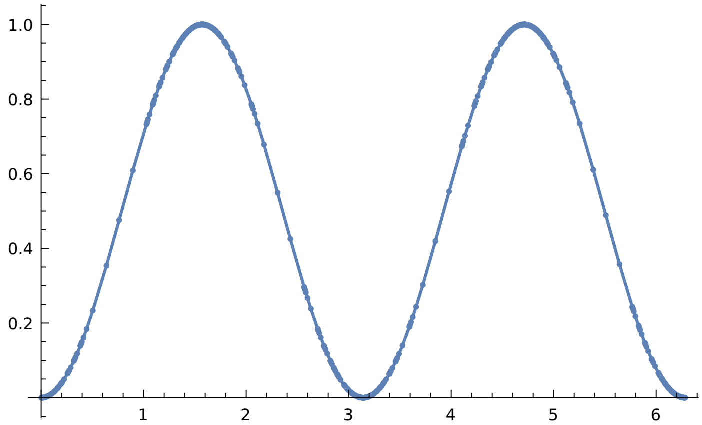
Out[52]=



In[53]:=

```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, Mesh → All]
```

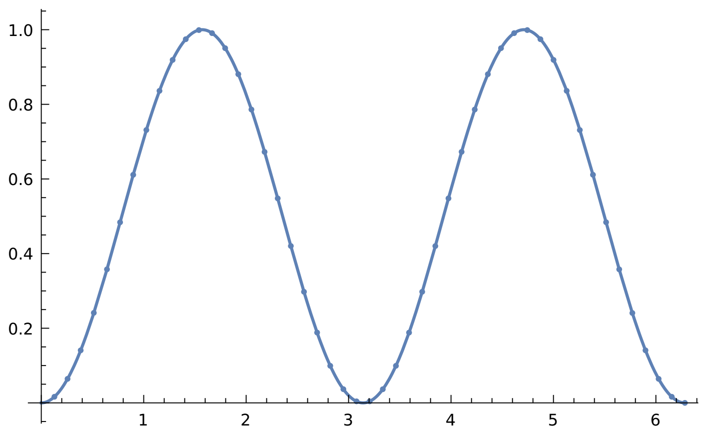
Out[54]=



In[55]:=

```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, Mesh → Full]
```

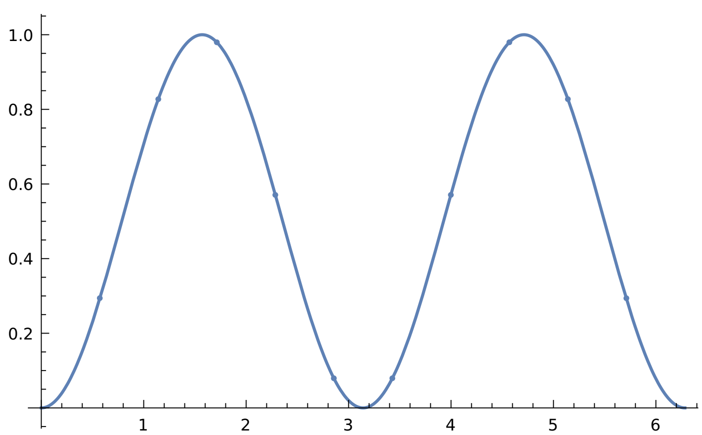
Out[56]=



In[57]:=

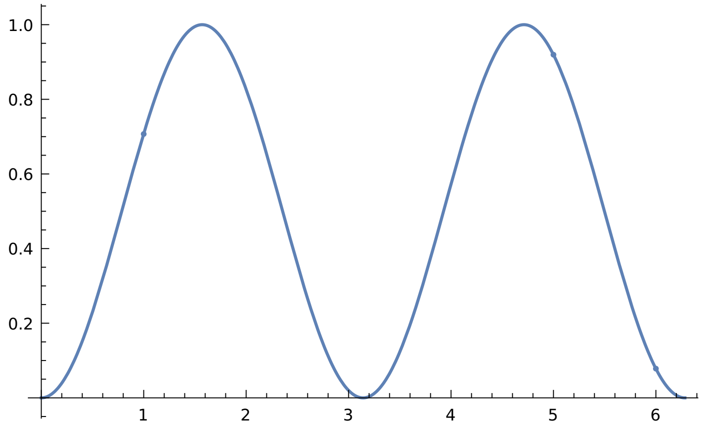
```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, Mesh → 10]
```

Out[58]=



In[59]:=
```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, Mesh → {{1, 5, 6}}]
```

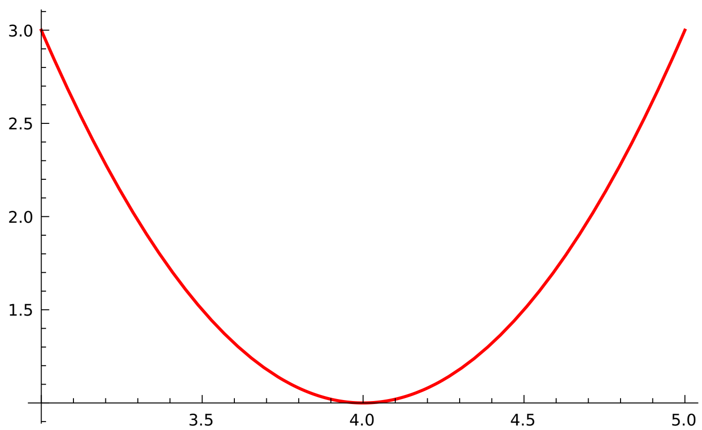
Out[60]=




```
Clear[f];
```

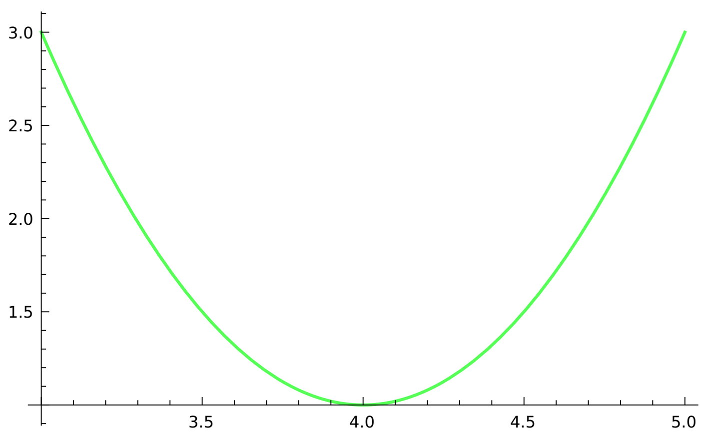
In[1]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Red]
```

Out[2]=



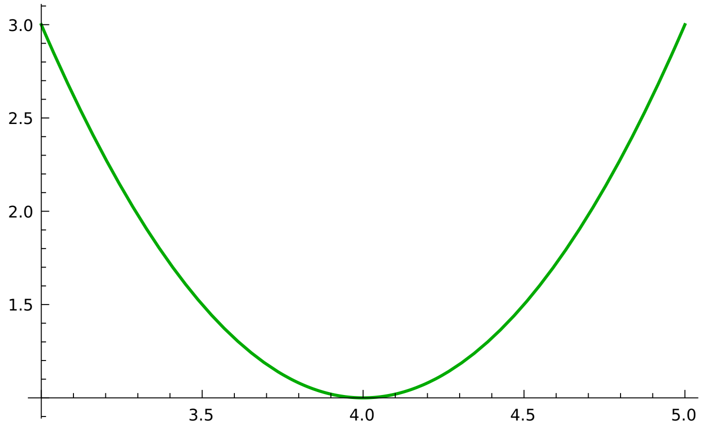
In[5]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Lighter[Green]]
```

Out[6]=



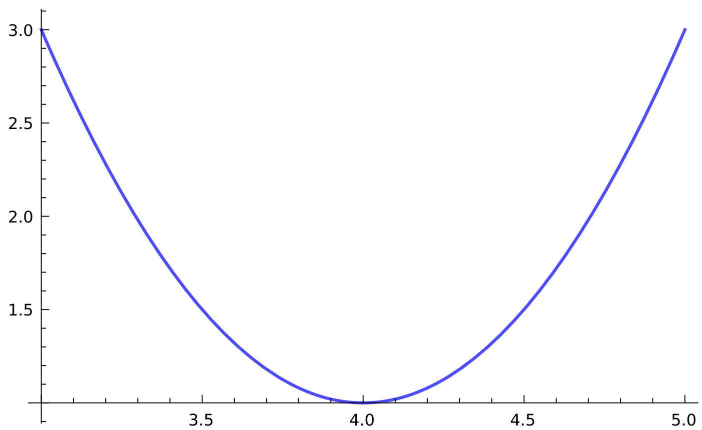
In[7]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Darker[Green]]
```

Out[8]=



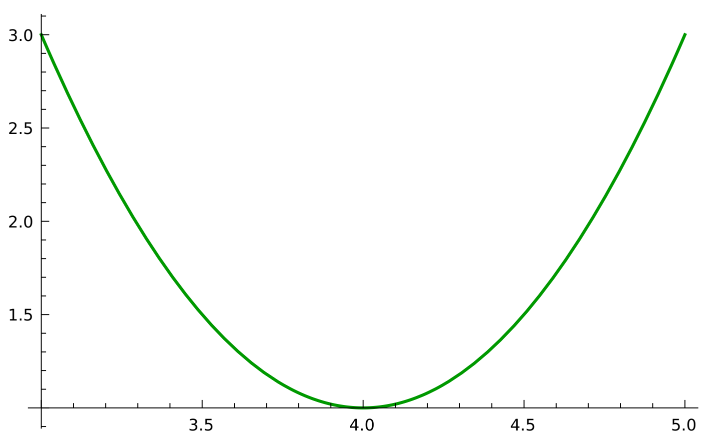
In[9]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Lighter[Blue, .3]]
```

Out[10]=



In[15]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Darker[Green, 0.4]]
```

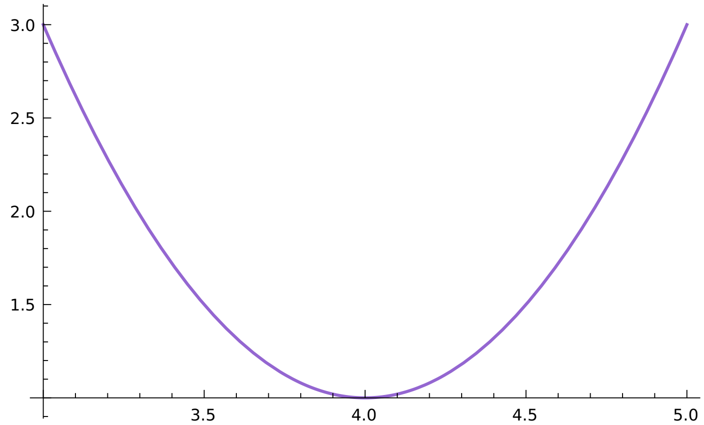
Out[16]=



In[25]:=

```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Lighter[Blend[{Blue, Red}, .3], 0.4]]
```

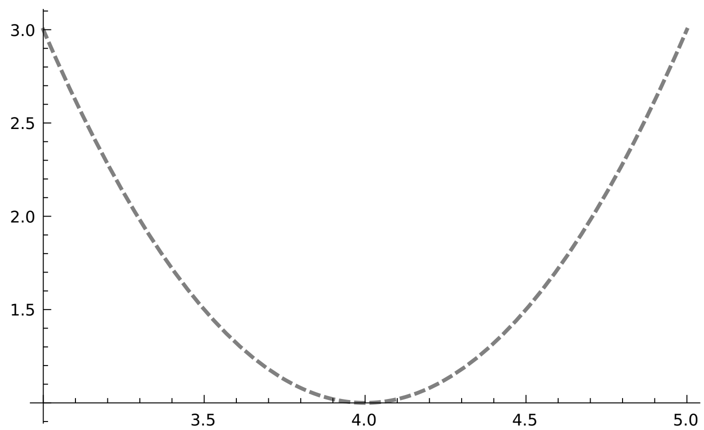
Out[26]=



In[27]:=

```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Directive[Thick, Gray, Dashed]]
```

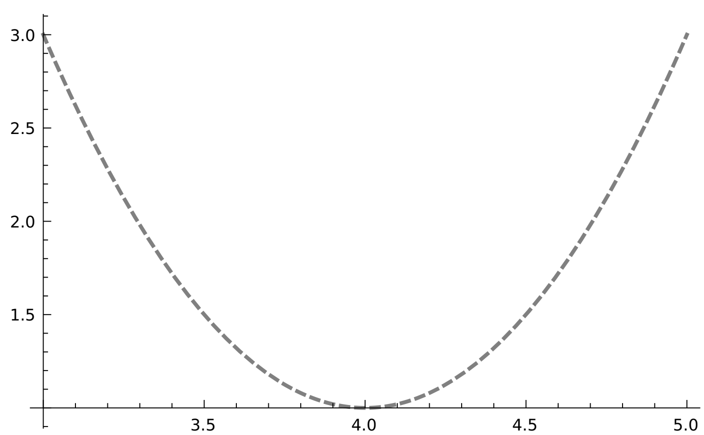
Out[28]=



In[29]:=

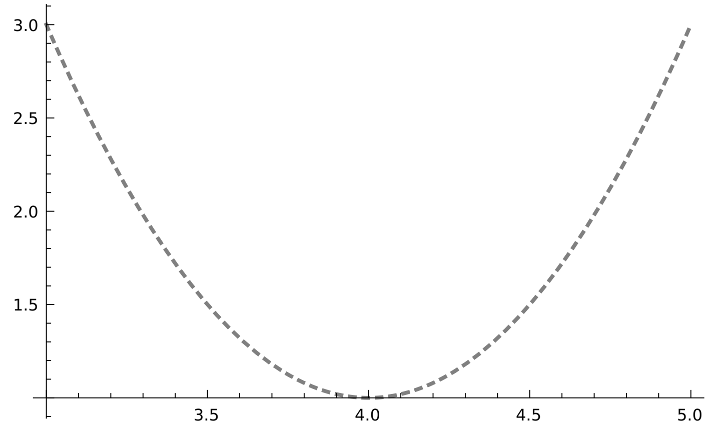
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Directive[Gray, Thick, Dashed]]
```

Out[30]=



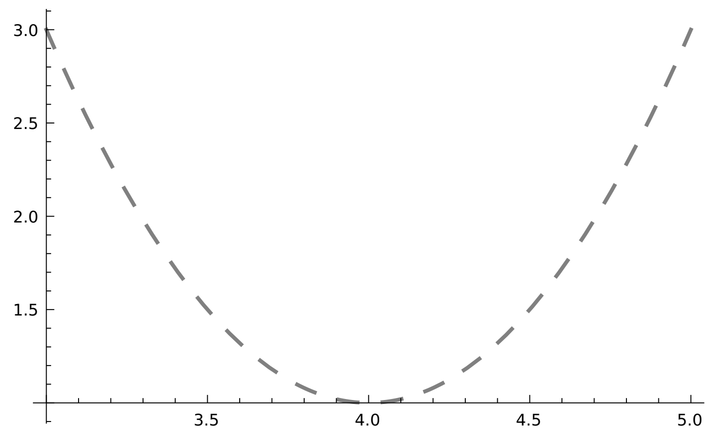
In[33]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Directive[Thick, Gray, Dashing[Small]]]
```

Out[34]=



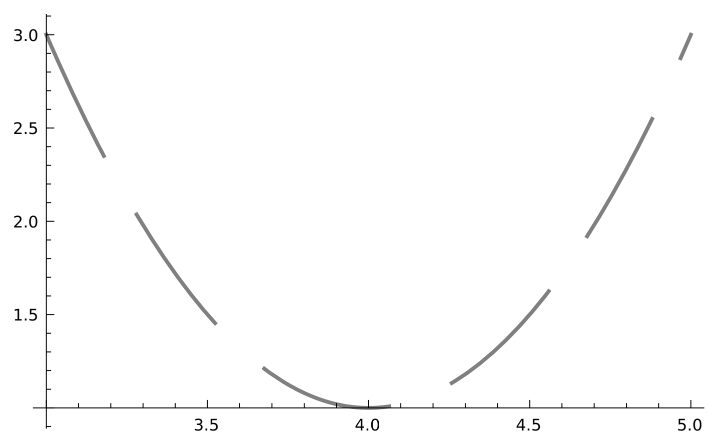
In[35]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Directive[Thick, Gray, Dashing[Large]]]
```

Out[36]=



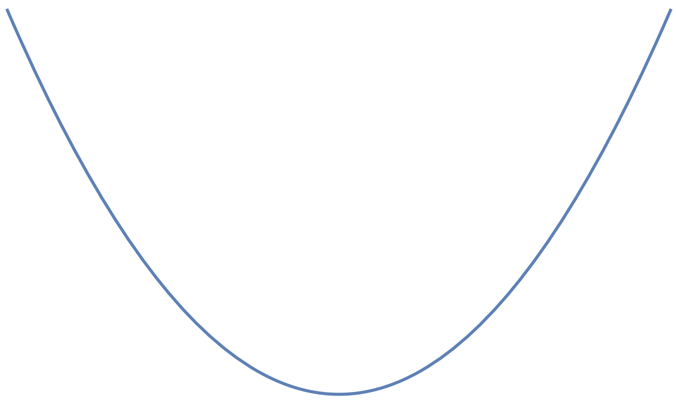
In[43]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, PlotStyle → Directive[Thick, Gray, Dashing[{.2, .1}]]]
```

Out[44]=



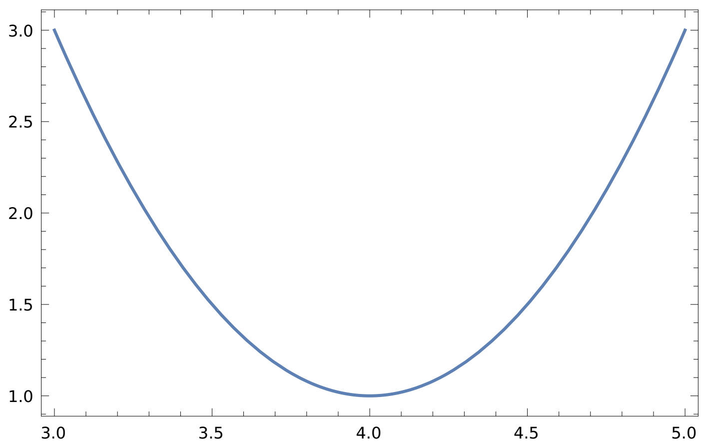
In[45]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, Axes → False]
```

Out[46]=



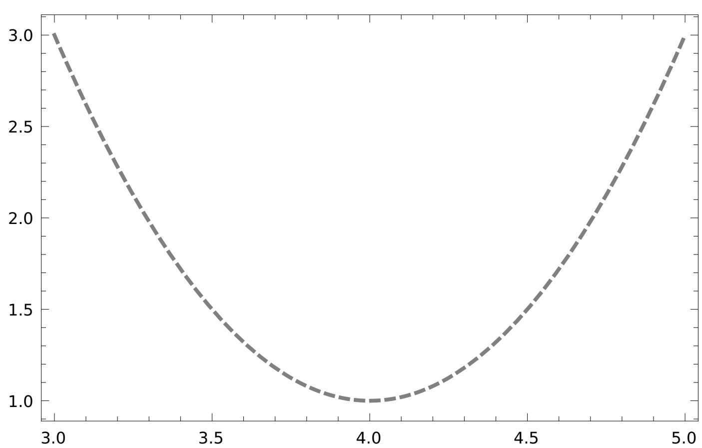
In[47]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, Frame → True]
```

Out[48]=

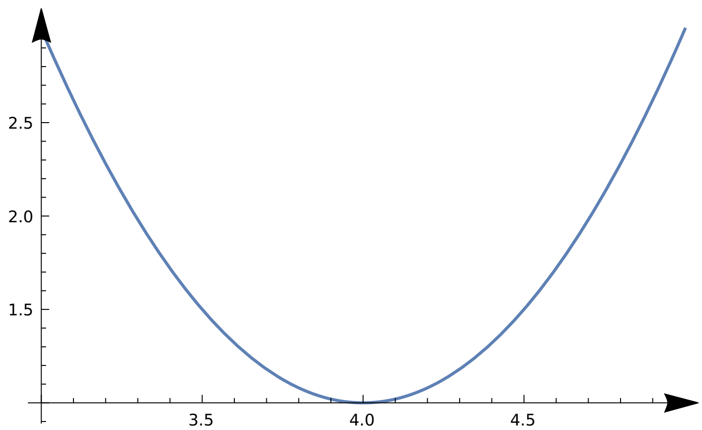


In[51]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5},
 PlotStyle → Directive[Thick, Gray, Dashed], Axes → False, Frame → True]
```

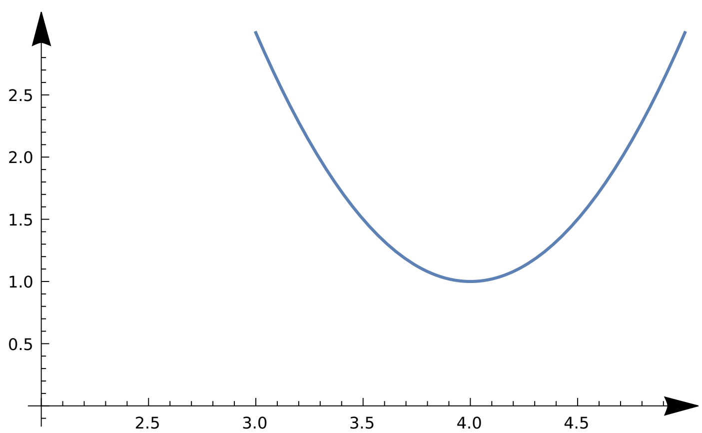
Out[52]=



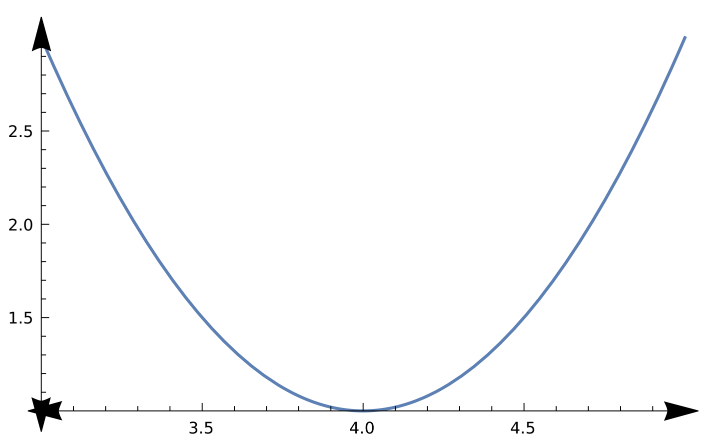
In[53]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, AxesStyle → Arrowheads [.05]]
```

Out[54]=


In[55]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, AxesStyle → Arrowheads [.05], AxesOrigin → {2, 0}]
```

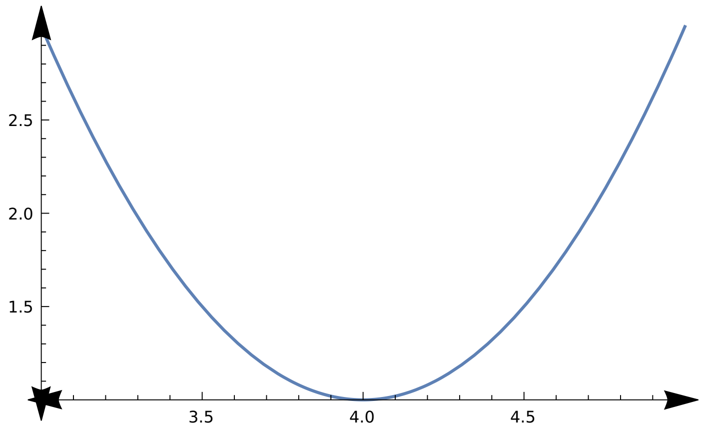
Out[56]=


In[59]:=
```
f[x_] := 2 (x - 4) ^ 2 + 1;
Plot[f[x], {x, 3, 5}, AxesStyle → Arrowheads [{- .05 , .05}]]
```

Out[60]=


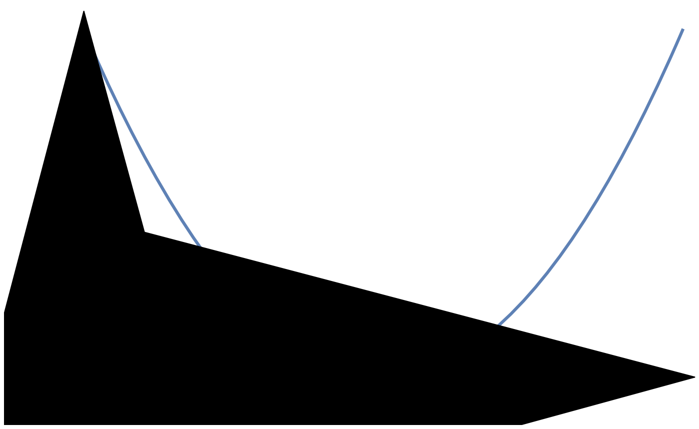
In[79]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, AxesStyle → Arrowheads[{-.05, .05}]]
```

Out[80]=



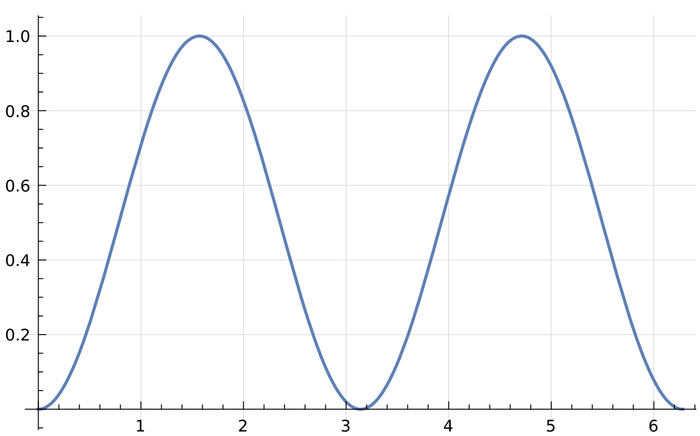
In[85]:=
```
f[x_] := 2 (x - 4)^2 + 1;
Plot[f[x], {x, 3, 5}, AxesStyle → Arrowheads[.9999999999999999999999999999 ]]
```

Out[86]=



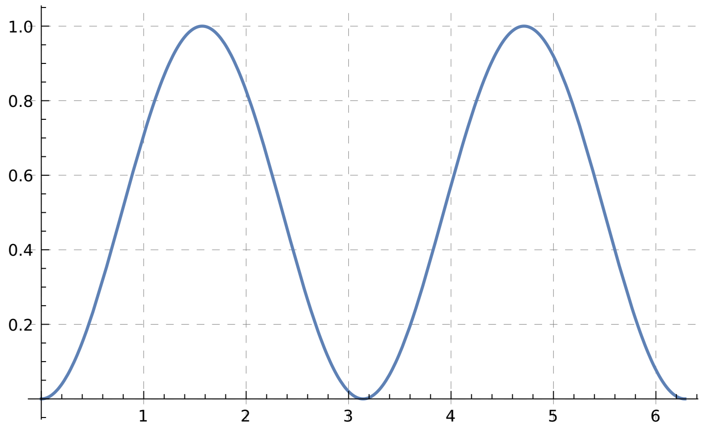
In[1]:=
```
Clear[f];
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → Automatic]
```

Out[3]=



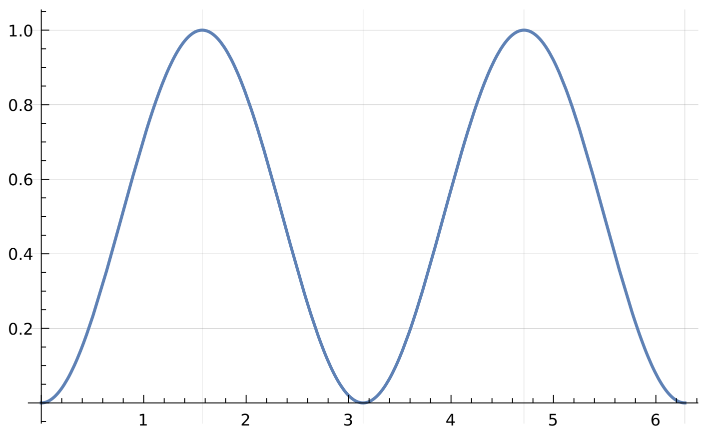
In[27]:=
```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → Automatic ,
 GridLinesStyle → Directive[Thin, Gray, Dashed]]
```

Out[28]=



In[10]:=
```
Clear[f];
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → {{π / 2, π, 3 π / 2, 2 π}, {.2, .4, .6, .8, 1}}]
```

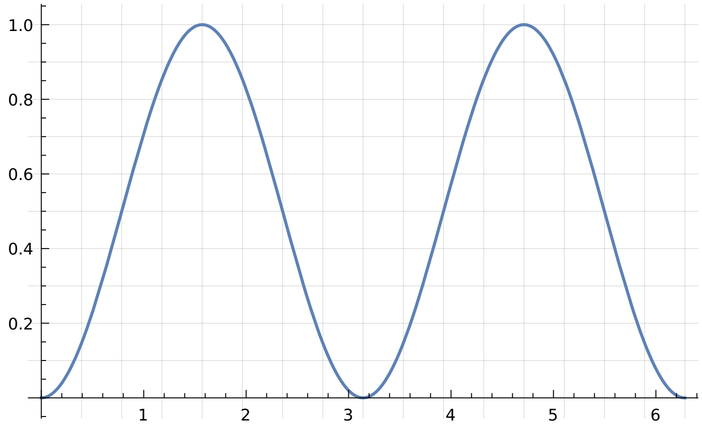
Out[12]=




```
Clear[f];
```

```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → {Range[0, 2 π, π / 8], Range[0, 1, 0.1]}]
```

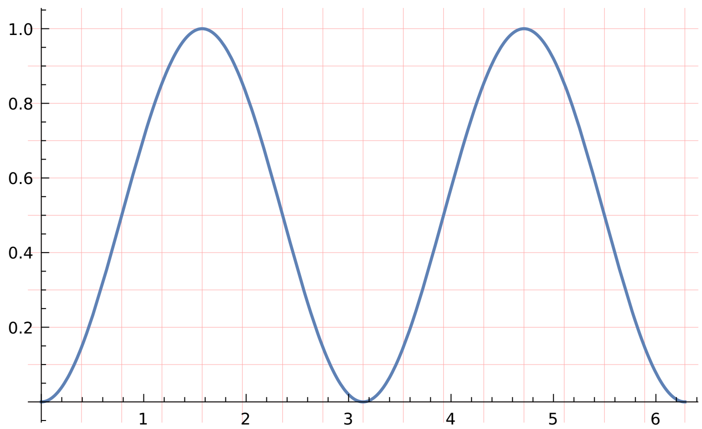
Out[14]=



In[25]:=

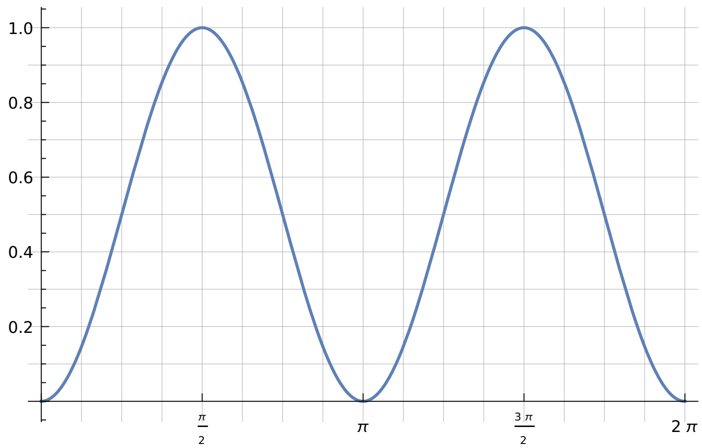
```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → {Range[0, 2 π, π / 8], Range[0, 1, 0.1]},
 GridLinesStyle → Directive[Thin, Lighter[Pink]]]
```

Out[26]=



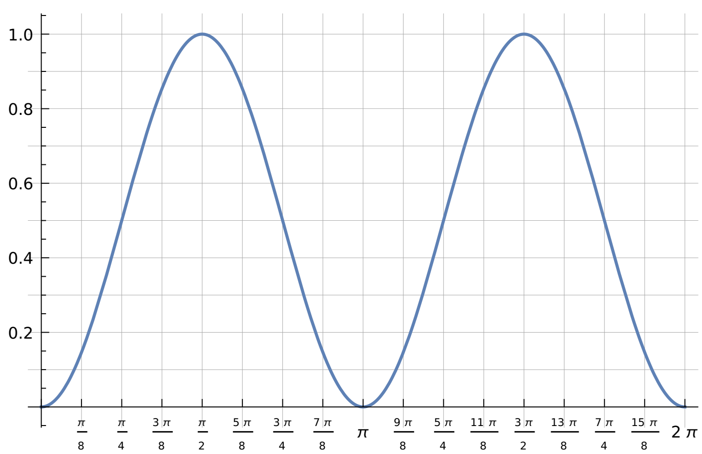
In[35]:=
```
Clear[f];
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → {Range[0, 2 π, π / 8], Range[0, 1, 0.1]},
 GridLinesStyle → Lighter[Gray], Ticks → {Range[0, 2 π, π / 2], Automatic}]
```

Out[37]=



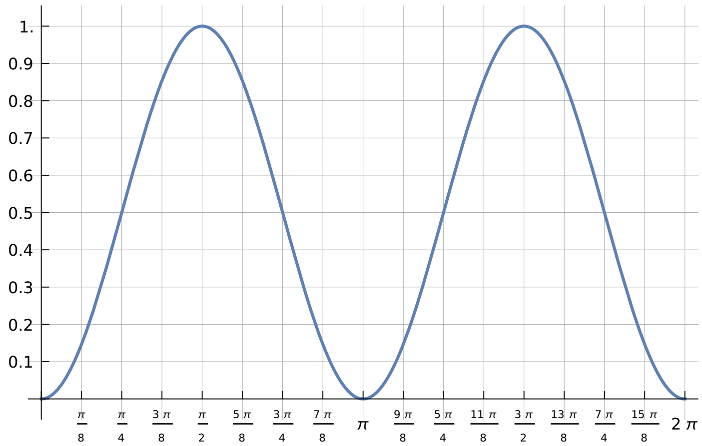
In[38]:=
```
f[x_] := Sin[x]^2;
Plot[f[x], {x, 0, 2 π}, GridLines → {Range[0, 2 π, π / 8], Range[0, 1, 0.1]},
 GridLinesStyle → Lighter[Gray], Ticks → {Range[0, 2 π, π / 8], Automatic}]
```

Out[39]=



```
In[40]:= f[x_] := Sin[x]^2;
         Plot[f[x], {x, 0, 2 π}, GridLines → {Range[0, 2 π, π / 8], Range[0, 1, 0.1]},
          GridLinesStyle → Lighter[Gray], Ticks → {Range[0, 2 π, π / 8], Range[0, 1, .1]}]
```

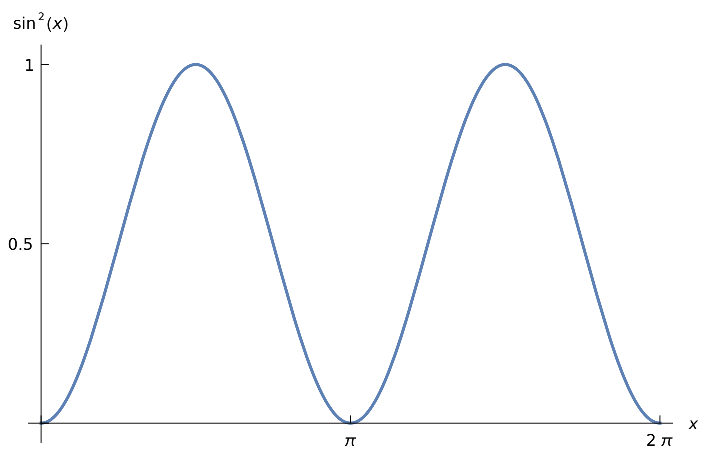
Out[41]=




```
Clear[f];
f[x_] := Sin[x]^2;
```

```
In[46]:= Plot[f[x], {x, 0, 2 π}, Ticks → {{0, π, 2 π}, {0, .5, 1}}, AxesLabel → {x, Sin[x]^2}]
```

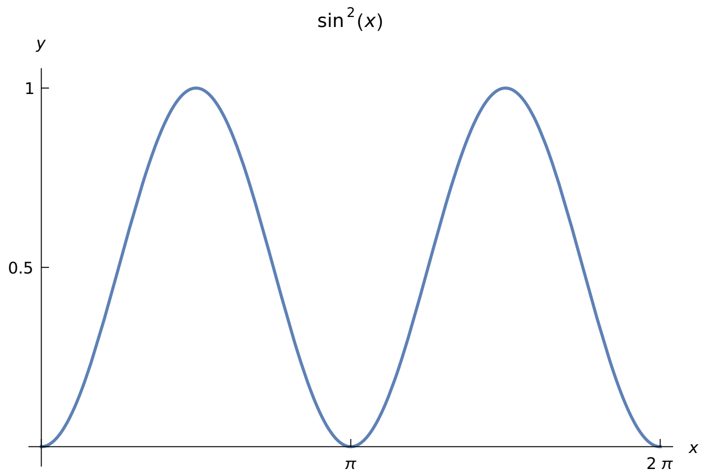
Out[46]=




```
f[x_] := Sin[x]^2;
```

In[47]:=
```
Plot[f[x], {x, 0, 2 π}, Ticks → {{0, π, 2 π}, {0, .5, 1}},
 AxesLabel → {x, y}, PlotLabel → Sin[x]^2]
```

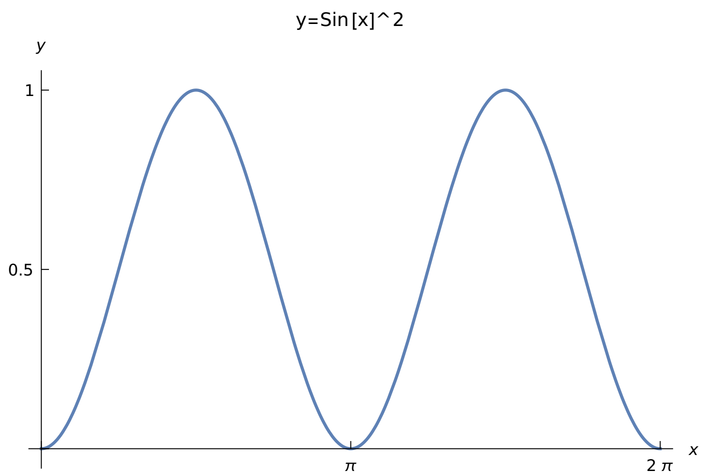
Out[47]=




```
f[x_] := Sin[x]^2;
```

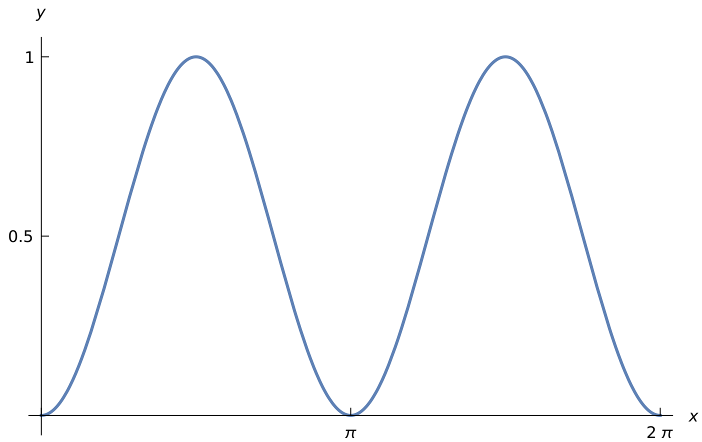
In[50]:=
```
Plot[f[x], {x, 0, 2 π}, Ticks → {{0, π, 2 π}, {0, .5, 1}},
 AxesLabel → {x, y}, PlotLabel → "y=Sin[x]^2"]
```

Out[50]=



In[51]:=
```
Clear[f];
f[x_] := Sin[x]^2;
p = Plot[f[x], {x, 0, 2 π}, Ticks → {{0, π, 2 π}, {0, .5, 1}}, AxesLabel → {x, y}];
Labeled[p, Text["y=Sin[x]^2"], Right]
```

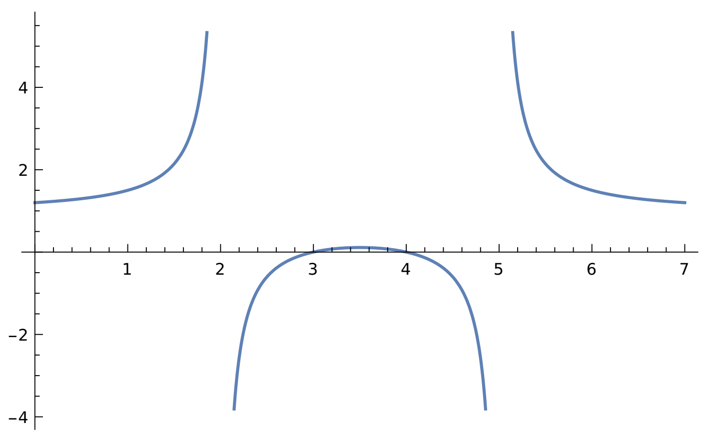
Out[54]=



y=Sin[x]^2

In[73]:=
```
Clear[f];
f[x_] := ((x - 3) * (x - 4)) / ((x - 2) * (x - 5));
Plot[f[x], {x, 0, 7}]
```

Out[75]=



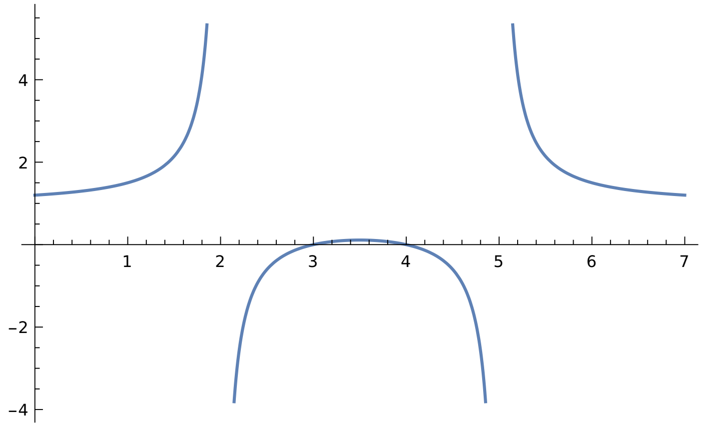
In[76]:=
```
f[x_] := ((x - 3) * (x - 4)) / ((x - 2) * (x - 5));
Plot[f[x], {x, 0, 2, 5, 7}]
```

Plot : Range specification {x, 0, 2, 5, 7} is not of the form {x, xmin , xmax }.

Out[77]= `Plot[f[x], {x, 0, 2, 5, 7}]`

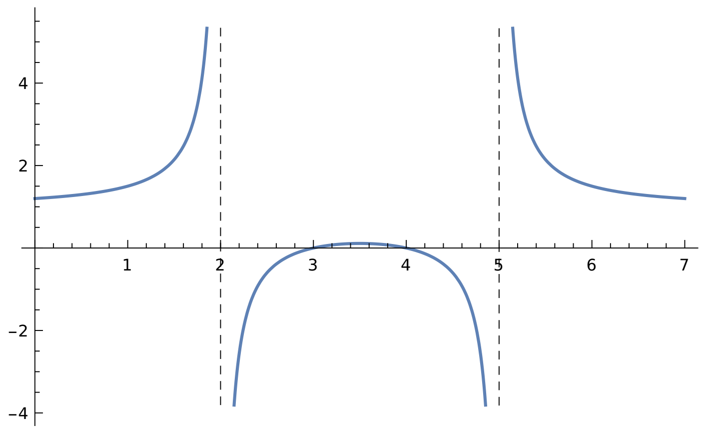
In[78]:=
```
f[x_] := ((x - 3) * (x - 4)) / ((x - 2) * (x - 5));
Plot[f[x], {x, 0, 7}, Exclusions → {x == 2, x == 5}]
```

Out[79]=



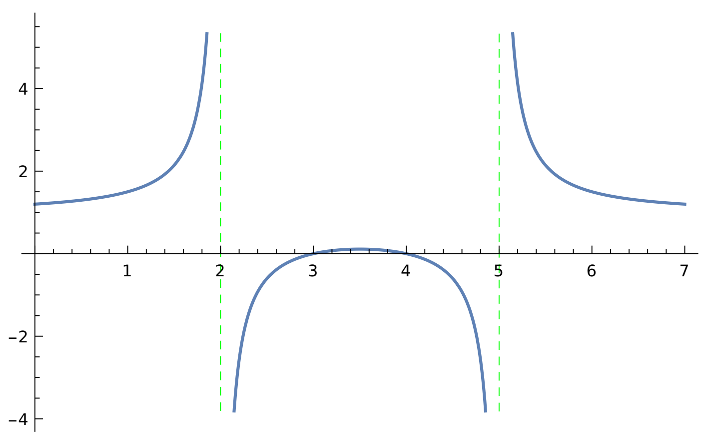
In[80]:=
```
f[x_] := ((x - 3) * (x - 4)) / ((x - 2) * (x - 5));
Plot[f[x], {x, 0, 7}, Exclusions → {x == 2, x == 5}, ExclusionsStyle → Dashed]
```

Out[81]=



In[86]:=
```
f[x_] := ((x - 3) * (x - 4)) / ((x - 2) * (x - 5));
Plot[f[x], {x, 0, 7}, Exclusions → {x == 2, x == 5},
 ExclusionsStyle → Directive[Green, Dashed]]
```

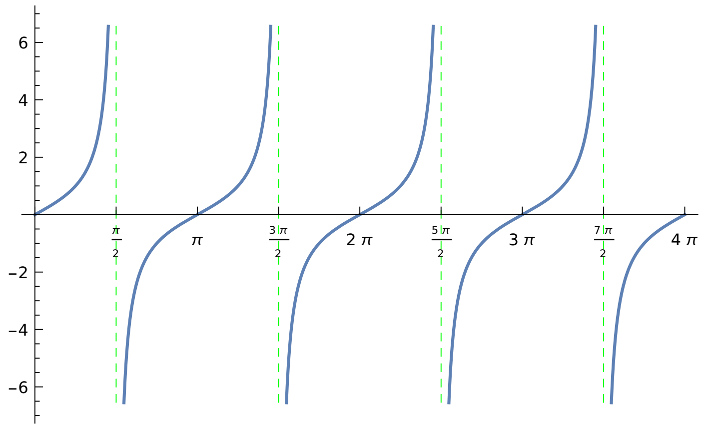
Out[87]=




```
Clear[f];
```

In[94]:=
```
f[x_] := Tan[x];
Plot[f[x], {x, 0, 4 π}, Exclusions → {Cos[x] == 0},
 ExclusionsStyle → Directive[Green, Dashed], Ticks → {Range[0, 4 π, π / 2], Automatic}]
```

Out[95]=

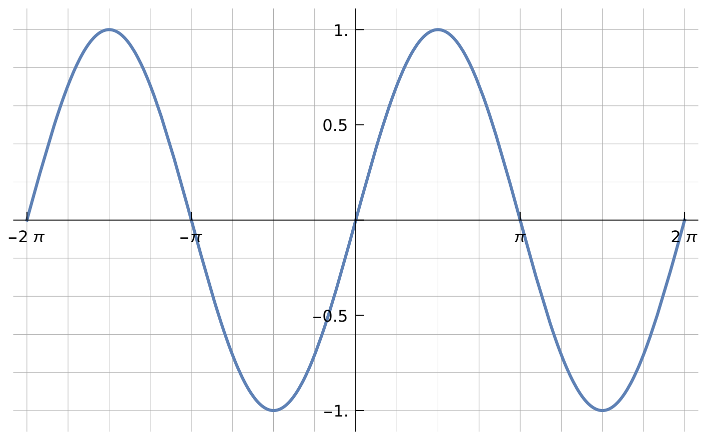


EXERCISE 3.3

(1)

In[8]:=
```
Clear[f];
f[x_] := Sin[x];
Plot[f[x], {x, -2 π, 2 π},
 GridLines → {Range[-2 π, 2 π, π / 4], Range[-1, 1, 1 / 5]}, GridLinesStyle → Lighter[Gray],
 Ticks → {{-2 π, -π, 0, π, 2 π}, {-1.0, -0.5, 0, 0.5, 1.0}}]
```

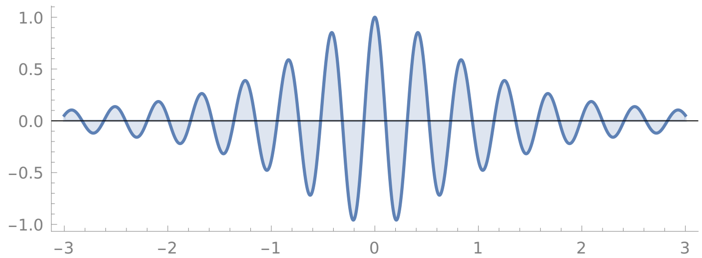
Out[10]=



(2)

In[32]:=
```
Clear[f];
f[x_] := Cos[15 x] / (1 + x ^ 2);
Plot[f[x], {x, -3, 3}, Filling → Axis, PlotRange → All,
 Axes → {True, False}, Frame → {True, True, False, False},
 FrameStyle → GrayLevel[0.5], AspectRatio → Automatic]
```

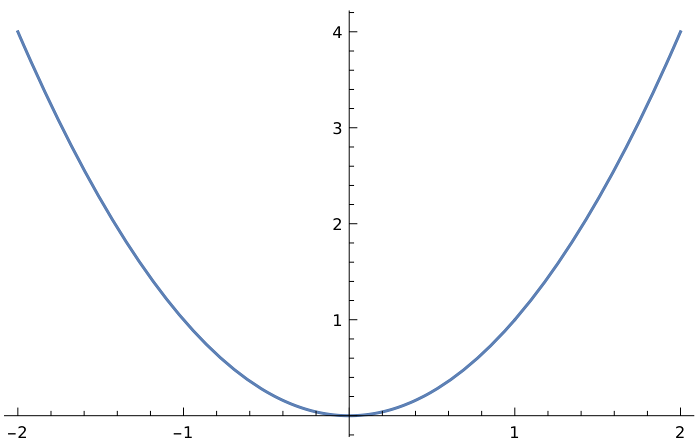
Out[34]=



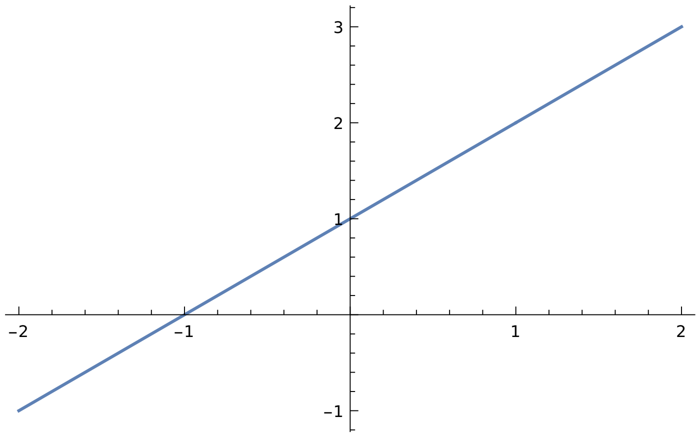
(4)

In[56]:=
```
Clear[f];
f[x_] := x ^ 2;
Plot[f[x], {x, -2, 2}, Exclusions → {x == 1}]
```

Out[58]=

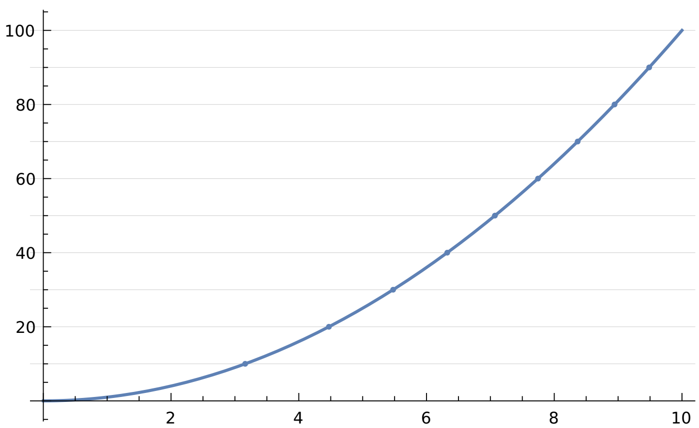


In[59]:=
```
Clear[f];
f[x_] := (x^2 - 1) / (x - 1);
Plot[f[x], {x, -2, 2}, Exclusions → {x == 1}]
```

Out[61]=


(5)

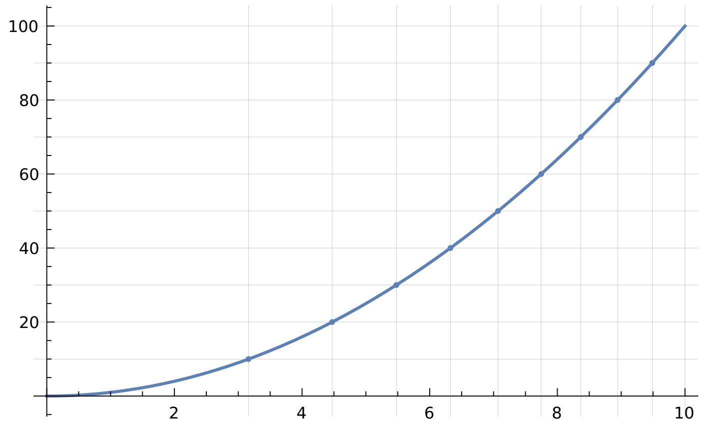
In[77]:=
```
Clear[f];
f[x_] := x^2;
Plot[f[x], {x, 0, 10}, Mesh → 9,
 MeshFunctions → {#2 &}, GridLines → {None, Range[0, 100, 10]}]
```

Out[79]=


5 (a)

In[90]:=
```
f[x_] := x^2;
Plot[f[x], {x, 0, 10}, Mesh → 9, MeshFunctions → {#2 &},
 GridLines → {Sqrt[Range[0, 100, 10]], Range[0, 100, 10]}]
```

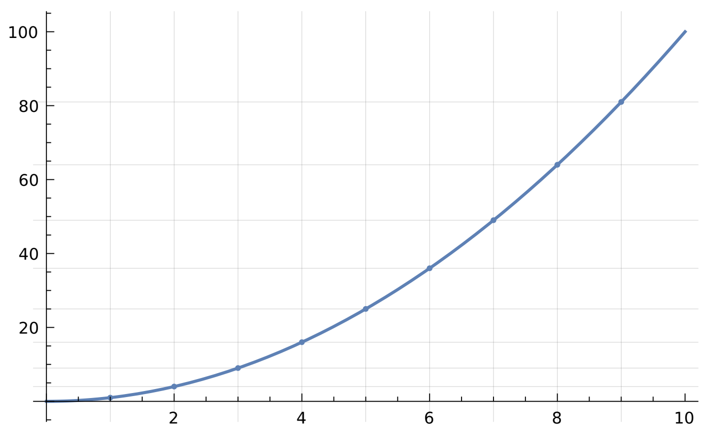
Out[91]=



5 (b)

In[102]:=
```
f[x_] := x^2;
Plot[f[x], {x, 0, 10}, Mesh → 9, MeshFunctions → {#1 &},
 GridLines → {Range[1, 9, 1], (Range[2, 9, 1])^2}]
```

Out[103]=

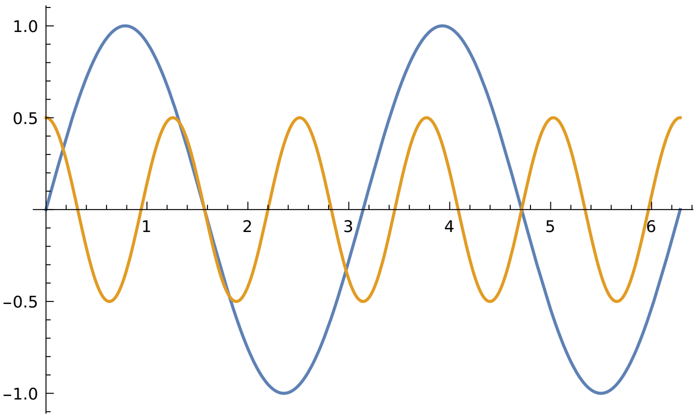


(6)

In[107]:=

```
Clear[f, g];
f[x_] := Sin[2 x];
g[x_] := (1 / 2) * Cos[5 x];
Plot[{f[x], g[x]}, {x, 0, 2 π}]
```

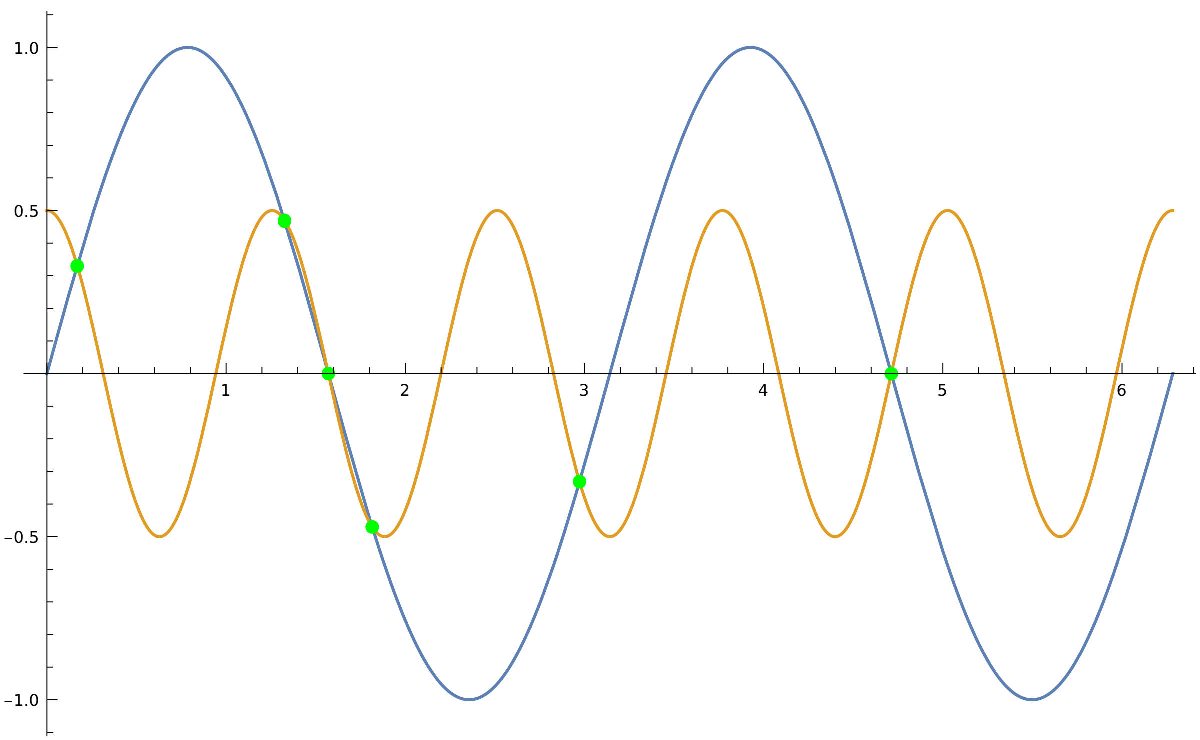
Out[110]=



In[123]:=

```
f[x_] := Sin[2 x];
g[x_] := (1 / 2) * Cos[5 x];
Plot[{f[x], g[x]}, {x, 0, 2 π}, Mesh → {{0}},
 MeshFunctions → {f[#] - g[#] &}, MeshStyle → Directive[PointSize[Large], Green]]
```

Out[125]=



In[1]:=

```
? f
```

Out[1]=

```
Missing[UnknownSymbol , f]
```

SECTION 3.5

In[2]:=
```
f[x_] := x^2;
Table[f[x], {x, 0, 10}]
```

Out[3]= {0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100}

In[4]:=
```
Table[f[x], {x, 0, 50, 5}]
```

Out[4]= {0, 25, 100, 225, 400, 625, 900, 1225, 1600, 2025, 2500}

In[5]:=
```
Table[f[x], {x, 10}]
```

Out[5]= {1, 4, 9, 16, 25, 36, 49, 64, 81, 100}

In[6]:=
```
Table[f[x], {x, 1, 10}]
```

Out[6]= {1, 4, 9, 16, 25, 36, 49, 64, 81, 100}

In[7]:=
```
Table[f[x], {x, 1, 10, 1}]
```

Out[7]= {1, 4, 9, 16, 25, 36, 49, 64, 81, 100}

In[8]:=
```
Table[f[x], {x, {1, 7, 12, 20}}]
```

Out[8]= {1, 49, 144, 400}

In[9]:=
```
s = Table[{x, f[x]}, {x, 5}]
```

Out[9]= {{1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}}

In[10]:=
```
Grid[s]
```

Out[10]=

1	1
2	4
3	9
4	16
5	25

In[13]:=
```
g[x_] := Sin[x];
t = Table[{x, g[x]}, {x, 0, 2 π, π / 4}]
```

Out[14]=

$$\left\{\{0, 0\}, \left\{\frac{\pi}{4}, \frac{1}{\sqrt{2}}\right\}, \left\{\frac{\pi}{2}, 1\right\}, \left\{\frac{3\pi}{4}, \frac{1}{\sqrt{2}}\right\}, \{\pi, 0\}, \left\{\frac{5\pi}{4}, -\frac{1}{\sqrt{2}}\right\}, \left\{\frac{3\pi}{2}, -1\right\}, \left\{\frac{7\pi}{4}, -\frac{1}{\sqrt{2}}\right\}, \{2\pi, 0\}\right\}$$

In[15]:=

```
Grid[t]
```

Out[15]=

0	0
$\frac{\pi}{4}$	$\frac{1}{\sqrt{2}}$
$\frac{\pi}{2}$	1
$\frac{3\pi}{4}$	$\frac{1}{\sqrt{2}}$
π	0
$\frac{5\pi}{4}$	$-\frac{1}{\sqrt{2}}$
$\frac{3\pi}{2}$	-1
$\frac{7\pi}{4}$	$-\frac{1}{\sqrt{2}}$
2π	0

In[16]:=

```
u = Table[{x, g[x], g[x]^2}, {x, 0, 2π, π/4}]
```

Out[16]=

$$\left\{\{0, 0, 0\}, \left\{\frac{\pi}{4}, \frac{1}{\sqrt{2}}, \frac{1}{2}\right\}, \left\{\frac{\pi}{2}, 1, 1\right\}, \left\{\frac{3\pi}{4}, \frac{1}{\sqrt{2}}, \frac{1}{2}\right\}, \{\pi, 0, 0\}, \left\{\frac{5\pi}{4}, -\frac{1}{\sqrt{2}}, \frac{1}{2}\right\}, \left\{\frac{3\pi}{2}, -1, 1\right\}, \left\{\frac{7\pi}{4}, -\frac{1}{\sqrt{2}}, \frac{1}{2}\right\}, \{2\pi, 0, 0\}\right\}$$

In[17]:=

```
Grid[u]
```

Out[17]=

0	0	0
$\frac{\pi}{4}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
$\frac{\pi}{2}$	1	1
$\frac{3\pi}{4}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
π	0	0
$\frac{5\pi}{4}$	$-\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
$\frac{3\pi}{2}$	-1	1
$\frac{7\pi}{4}$	$-\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
2π	0	0

In[18]:=

```
i = Table[{g[x], g[x]^2, g[x]^3}, {x, 0, π, π/2}]
```

Out[18]=

```
{{0, 0, 0}, {1, 1, 1}, {0, 0, 0}}
```

In[19]:=

```
Grid[i]
```

Out[19]=

0	0	0
1	1	1
0	0	0

In[20]:=
```
? f
```

Out[20]=

Symbol

Global`f

Definitions

f[x_] := x^2

Full Name Global`f

In[24]:=
```
Clear[f];
f[x_] := x^2;
t = Table[{x, f[x]}, {x, 0, 5}]
```

Out[26]= {{0, 0}, {1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}}

In[29]:=
```
Grid[t]
```

Out[29]=

0	0
1	1
2	4
3	9
4	16
5	25

In[31]:=
```
Text[Grid[t, Alignment → Right]]
```

Out[31]=

0	0
1	1
2	4
3	9
4	16
5	25

In[32]:=
```
Text@Grid[t, Alignment → Right]
```

Out[32]=

0	0
1	1
2	4
3	9
4	16
5	25

In[33]:=
```
Text@Grid[t, Alignment → Left]
```

Out[33]=

0	0
1	1
2	4
3	9
4	16
5	25

In[36]:=
```
t = Table[{x, f[x]}, {x, 0, 6}]
```

Out[36]=
```
{{0, 0}, {1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}, {6, 36}}
```

In[41]:=
```
p = Prepend[t, {"x", "x^2"}]
```

Out[41]=
```
{{x, x^2}, {0, 0}, {1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}, {6, 36}}
```

In[42]:=
```
Grid[p]
```

Out[42]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36

In[44]:=
```
Text@Grid[p, Alignment → Right]
```

Out[44]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36

In[48]:=
```
Clear[f];
f[x_] := x^2;
t = Table[{x, f[x]}, {x, 0, 10}]
```

Out[50]=
```
{{0, 0}, {1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}, {6, 36}, {7, 49}, {8, 64}, {9, 81}, {10, 100}}
```

In[52]:=
```
p = Prepend[t, {"x", "x^2"}]
```

Out[52]=
```
{{x, x^2}, {0, 0}, {1, 1}, {2, 4}, {3, 9},
 {4, 16}, {5, 25}, {6, 36}, {7, 49}, {8, 64}, {9, 81}, {10, 100}}
```

In[53]:=
```
Grid[p]
```

Out[53]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

In[54]:=
```
Text@Grid[p, Alignment → Right, Spacings → 2, Dividers → {Center, {False, True}}]
```

Out[54]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

In[55]:=
```
Text@Grid[p, Alignment → Right, Spacings → 2, Dividers → {2 → True, 2 → True}]
```

Out[55]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

```
In[61]:= Text@Grid[p, Alignment → Center, Spacings → 6, Dividers → All]
```

Out[61]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

```
In[65]:= Text@Grid[p, Alignment → {{Right, Left}}, Spacings → 6,
           Dividers → {{1 → True, 2 → True}, {6 → True, 2 → True}}]
```

Out[65]=

x	x^2
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

```
In[66]:= ? Q

Out[66]= Missing[UnknownSymbol , Q]

In[76]:= Clear[f];
         z = Table[{x, x ^ 2, 2 ^ x}, {x, 10}]

Out[77]= {{1, 1, 2}, {2, 4, 4}, {3, 9, 8}, {4, 16, 16}, {5, 25, 32},
          {6, 36, 64}, {7, 49, 128}, {8, 64, 256}, {9, 81, 512}, {10, 100, 1024}}

In[78]:= p = Prepend[z, {"x", "x^2", "2^x"}]

Out[78]= {{x, x^2, 2^x}, {1, 1, 2}, {2, 4, 4}, {3, 9, 8}, {4, 16, 16}, {5, 25, 32},
          {6, 36, 64}, {7, 49, 128}, {8, 64, 256}, {9, 81, 512}, {10, 100, 1024}}
```

```
In[79]:= Grid[p]
```

Out[79]=

x	x^2	2^x
1	1	2
2	4	4
3	9	8
4	16	16
5	25	32
6	36	64
7	49	128
8	64	256
9	81	512
10	100	1024

```
In[80]:= Text@Grid[p, Alignment → Right, Spacings → 6, Dividers → All]
```

Out[80]=

x	x^2	2^x
1	1	2
2	4	4
3	9	8
4	16	16
5	25	32
6	36	64
7	49	128
8	64	256
9	81	512
10	100	1024

```
In[83]:= Text@Grid[p, Alignment → Right, Spacings → 6,
           Dividers → {{True, True, True, True}, {1 → True, 2 → True, 12 → True}}]
```

Out[83]=

x	x^2	2^x
1	1	2
2	4	4
3	9	8
4	16	16
5	25	32
6	36	64
7	49	128
8	64	256
9	81	512
10	100	1024

```
In[93]:= c = Table[{x, x^2}, {x, 1, 10}]

Out[93]= {{1, 1}, {2, 4}, {3, 9}, {4, 16}, {5, 25}, {6, 36}, {7, 49}, {8, 64}, {9, 81}, {10, 100}}
```

In[101]:=
```
TableForm[c, TableHeadings → {None, {"x", "x^2"}},
 TableSpacing → 5, TableDirections → Row, TableAlignments → Right]
```

Out[101]//TableForm=

x	1	2	3	4	5	6	7	8	9	10
x^2	1	4	9	16	25	36	49	64	81	100

EXERCISE 3.5

1 (a)

In[1]:=
```
Range[100]
```

Out[1]=
```
{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[2]:=
```
Partition[Range[100], 10]
```

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}}
```

(b)

In[5]:=
```
t = Partition[Range[100], 20]
```

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}}
```

In[8]:=
```
Grid[t]
```

Out[8]=

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

2 (a)

In[9]:=
```
Style[4, Red]
```

Out[9]= 4

In[10]:=
```
Style[4, 72]
```

Out[10]= 4

In[11]:=
```
Style[4, "Section"]
```

Out[11]= 4

In[12]:=
```
Style[4, FontFamily → "Helvetica", FontWeight → "Bold"]
```

Out[12]= **4**

(b)

In[16]:=
```
t = Table[{x, x^2, x^3, x^4}, {x, 5}]
```

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

In[17]:=
```
Grid[t]
```

Out[17]=

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

In[18]:=
```
Style[Grid[t], FontFamily → "Cosmic Sans MS", Blue]
```

Out[18]=

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

3 (a)

In[20]:=
```
? PrimeQ
```

Out[20]=

Symbol

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

In[21]:= ? P*Q

Out[21]=

System`

PacletNewerQ	PermissionsGroupMemberQ	PolynomialQ	PrimitivePolynomialQ
PacletObjectQ	PermutationCyclesQ	PositiveDefiniteMatrixQ	PrintableASCIIQ
PalindromeQ	PermutationListQ	PositiveSemidefiniteMatrixQ	ProcessParameterQ
PartitionsQ	PlanarGraphQ	PossibleZeroQ	
PathGraphQ	PointProcessParameterQ	PrimePowerQ	
PerfectNumberQ	PolynomialExpressionQ	PrimeQ	

```
In[22]:= PrimeQ[2]
Out[22]= True

In[24]:= PrimeQ[72 428 715 265 472 362 187 468 124 627 ]
Out[24]= False

In[26]:= PrimeQ[11]
Out[26]= True
```

(b)

```
In[29]:= Table[If[PrimeQ[n], Style[n, Red], n], {n, 100}]
Out[29]= {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[35]:= t = Table[If[PrimeQ[n], Style[n, Red], n], {n, 100}]
Out[35]= {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[37]:=
```
p = Partition[t, 10]
```

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}}
```

In[38]:=
```
Grid[p]
```

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)

In[44]:=
```
l = Table[If[SquareFreeQ[n], Style[n, Blue, Underlined], n], {n, 100}]
```

Out[44]=
```
{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[46]:=
```
q = Partition[l, 10]
```

Out[46]=
```
{{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[47]:=
```
Grid[q]
```

Out[47]=

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)

In[50]:=
```
t = Table[If[PrimePowerQ[n], Style[n, Orange, Italic], n], {n, 100}]
```

Out[50]=
```
{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[51]:=
```
p = Partition[t, 10]
```

Out[51]=
```
{{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[52]:=
```
Grid[p]
```

Out[52]=

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[53]:=
```
Text@Grid[p]
```

Out[53]=

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

4 (a)

In[54]:=
```
Sum[n^3, {n, 20}]
```

Out[54]=
```
44100
```

(b)

In[59]:=
```
Clear[f];
f[x_] := Sum[n ^ x, {n, 20}];
t = Table[{x, f[x]}, {x, 1, 10}]
```

Out[61]=
```
{{1, 210}, {2, 2870}, {3, 44 100}, {4, 722 666}, {5, 12 333 300}, {6, 216 455 810},
 {7, 3 877 286 700}, {8, 70 540 730 666}, {9, 1 299 155 279 940}, {10, 24 163 571 680 850}}
```

In[62]:=
```
Grid[t]
```

Out[62]=

1	210
2	2870
3	44 100
4	722 666
5	12 333 300
6	216 455 810
7	3 877 286 700
8	70 540 730 666
9	1 299 155 279 940
10	24 163 571 680 850

MOREOVER ,

In[70]:=
```
Text@Grid[t, Spacings → 6,
  Alignment → {{Left}, {Right}}, Dividers → {{1 → True, 3 → True}, All}]
```

Out[70]=

1	210
2	2870
3	44 100
4	722 666
5	12 333 300
6	216 455 810
7	3 877 286 700
8	70 540 730 666
9	1 299 155 279 940
10	24 163 571 680 850

In[71]:=
```
Text@Grid[t, Spacings → 6, Alignment → {{Left}, {Right}}, Dividers → {Center, All}]
```

Out[71]=

1	210
2	2870
3	44 100
4	722 666
5	12 333 300
6	216 455 810
7	3 877 286 700
8	70 540 730 666
9	1 299 155 279 940
10	24 163 571 680 850

In[72]:=
```
Text@Grid[t, Spacings → 6, Alignment → {{Left}, {Right}},
  Dividers → {{1 → True, 3 → True}, {1 → True, 3 → True, 5 → True}}]
```

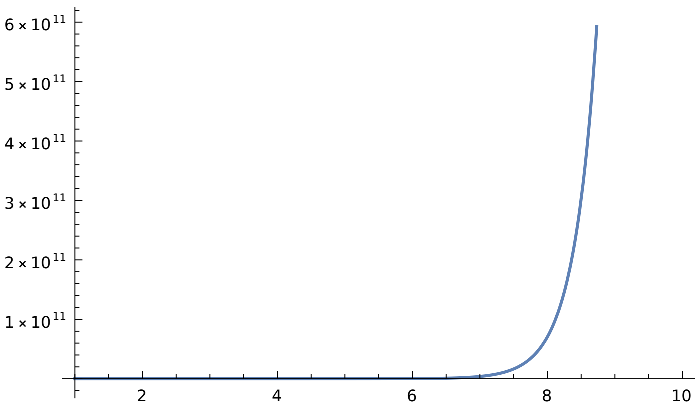
Out[72]=

1	210
2	2870
3	44 100
4	722 666
5	12 333 300
6	216 455 810
7	3 877 286 700
8	70 540 730 666
9	1 299 155 279 940
10	24 163 571 680 850

(c)

In[73]:=
```
Plot[f[x], {x, 1, 10}]
```

Out[73]=



In[74]:=
```
? f
```

Out[74]=

Symbol

Global`f

Definitions

f[x_] := $\sum_{n}^{20} n^x$

Full Name Global`f