In[45]:=
```
(**Programming Lanauge: Wolfram Language (Mathematica)**)

(**Problem 2**)

(**Mathematica is weird with how it handles variables
 so people often include this to amke it less annoying**)
Remove["Global`*"]

f[x_] := x^2 - 4 x + 3

p0 = 1.99;
p1 = p0;

tol = 10^-5;
k = 0;

While[

 p0 = p1;
 p1 = p0 - f[p0]/f'[p0];
 Abs[p1 - p0] >= tol,

 k = k + 1;

 Print["p"_k, " = ", N[p1, 10]]
]
```

p_1 = -48.005

p_2 = -23.0125

p_3 = -10.5262

p_4 = -4.30304

p_5 = -1.23084

p_6 = 0.229819

p_7 = 0.832453

p_8 = 0.987978

p_9 = 0.999929

p_{10} = 1.

In[40]:=
```
p0 = 2.01;
p1 = p0;

tol = 10^-5;
k = 0;

While[

 p0 = p1;
 p1 = p0 - f[p0]/f'[p0];
 Abs[p1 - p0] >= tol,

 k = k + 1;

 Print["p"_k, " = ", N[p1, 10]]
]
```

p_1 = 52.005

p_2 = 27.0125

p_3 = 14.5262

p_4 = 8.30304

p_5 = 5.23084

p_6 = 3.77018

p_7 = 3.16755

p_8 = 3.01202

p_9 = 3.00007

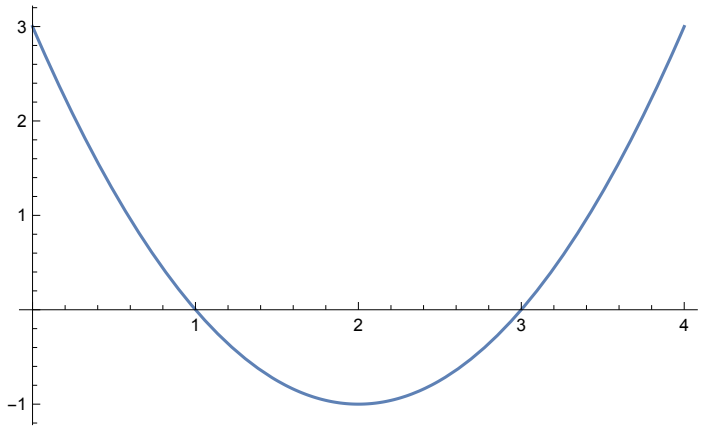
p_{10} = 3.

In[52]:=
```
(**What we find is that this time even though 2.01 is
 close to 1.99 the sequence converges to the other root of 3.**)

Plot[f[x], {x, 0, 4}]
Solve[f'[x] == 0, x]

(**This is because (as shown with the above code)
  the sign of the derivative of f[x] changes at x = 2.**)
```

Out[52]=



Out[53]= $\{\{x \to 2\}\}$

```
(**Problem 3**)

Remove["Global`*"]

(**In Mathematica all reserved names begin with capital letters,
even the constant e!**)
g[x_] := 3 x - E^x

p0 = 1;
p1 = 2;

tol = 10^-5;

p2 = p1;
p1 = p0;

k = 0;

(**This expression will be aborted after 30 seconds of attempted evaluation**)
(**If the series doesn't converge within a reasonable
 amount of time I think it's safe to say it does not converge**)

TimeConstrained[
 While[
  p0 = p1;
  p1 = p2;

  p2 = p1 - g[p1] (p1 - p0) / (g[p1] - g[p0]);

  Abs[p2 - p1] >= tol,

  k = k + 1;

  Print["p"_k, " = ", N[p2, 10]]
 ]
 , 30]

(**In this case the sequence does not converge.**)
```

p_1 = 1.168615340

p_2 = 1.311516555

p_3 = 1.797043010

p_4 = 1.436777893

p_5 = 1.486766287

p_6 = 1.515325761

p_7 = 1.512011934

Out[62]= $Aborted

In[63]:=
```
g[x_] := 3 x - E^x

(**Mathematica's answer to this problem
 to this problem to see if we are right**)
NSolve[g[x] == 0, x]

(**We choose this points because we know the root is somewhere near 1.5**)
p0 = 2;
p1 = 1.5;

tol = 10^-5;

p2 = p1;
p1 = p0;

k = 0;

While[
 p0 = p1;
 p1 = p2;

 p2 = p1 - (g[p1] (p1 - p0))/(g[p1] - g[p0]);

 Abs[p2 - p1] >= tol,

 k = k + 1;
 Print["p"_k, " = ", N[p2, 10]]
]
```

NSolve::ifun : Inverse functions are being used by NSolve,
so some solutions may not be found; use Reduce for complete solution information. >>

Out[64]=
```
{{x → 0.619061}, {x → 1.51213}}
```

$p_1 = 1.50651$

$p_2 = 1.51224$

$p_3 = 1.51213$