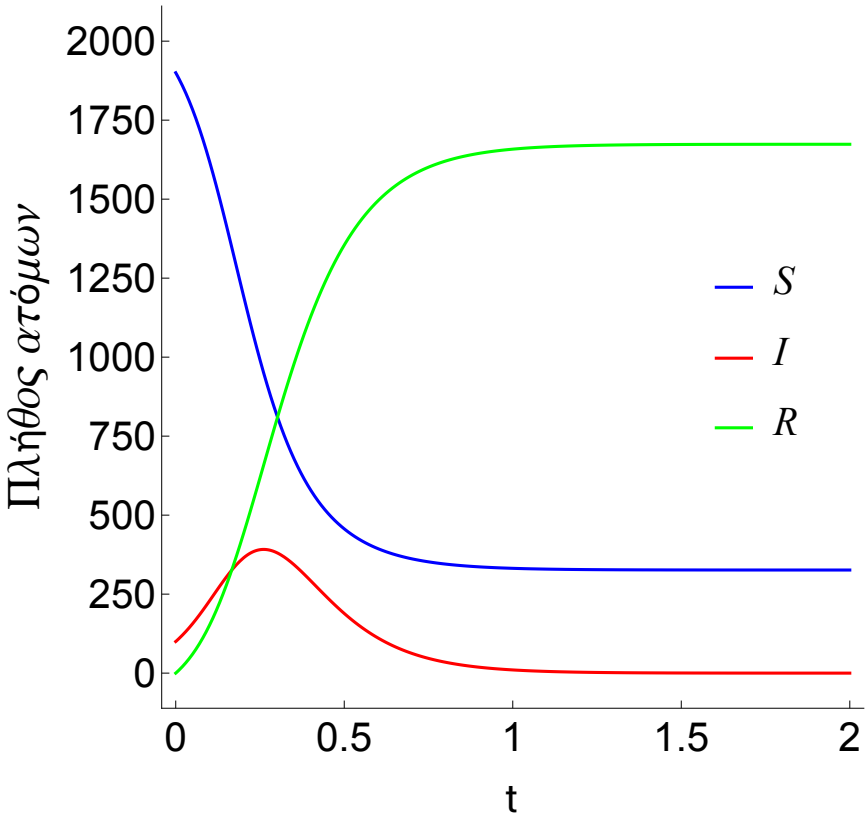
In[1]:=
```
N = 2 * 10^3;
beta = 0.01;
gamma = 9.5;
mu = 0;
S0 = 1.9 * 10^3;
I0 = 10^2;
R0 = N - S0 - I0;
tend = 2;
S =.;
I =.;
R =.;
```

In[10]:=
```
Sol0 = NDSolve[{D[S[t], t] == mu * N - beta * S[t] * I[t] - mu * S[t], D[I[t], t] ==
      beta * S[t] * I[t] - (gamma + mu) * I[t], D[R[t], t] == gamma * I[t] - mu * R[t],
     S[0] == S0, I[0] == I0, R[0] == R0}, {S, I, R}, {t, 0, tend}];
Plot10 = Plot[Evaluate[S[t] /. First[Sol0]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, S}, PlotRange → All, PlotStyle → Blue,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot20 = Plot[Evaluate[I[t] /. First[Sol0]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, I}, PlotRange → All, PlotStyle → Red,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot30 = Plot[Evaluate[R[t] /. First[Sol0]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, R}, PlotRange → All, PlotStyle → Green,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
MP0 = Show[Plot10, Plot20, Plot30, PlotRange → {{0, tend}, {0, 2000}}, Epilog →
    Inset[Column[{LineLegend[{Blue, Red, Green}, {"S", "I", "R"}, LabelStyle →
          {FontFamily → "Times New Roman", FontSize → 21, FontSlant → Italic}]}],
     Scaled[{0.85, 0.5}]], MaxRecursion → 0, PlotPoints → {200, 100},
  AspectRatio → 1, AxesOrigin → {0, 0}, RotateLabel → True,
  LabelStyle → {21, GrayLevel[0]},
  FrameTicks → {{{0, 250, 500, 750, 1000, 1250, 1500, 1750, 2000}, None},
    {{0, 0.5, 1, 1.5, 2}, None}}, ImageSize → {450, 450},
  AspectRatio → Full, PlotLabel → None, LabelStyle → {21, GrayLevel[0]}]
```

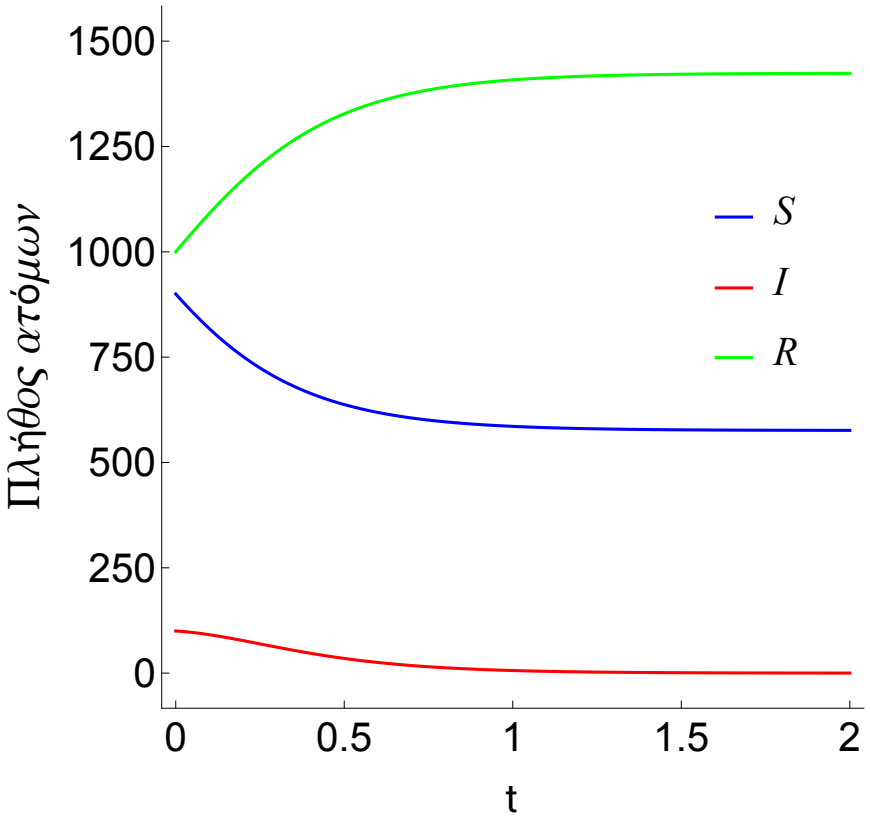
Out[14]=



In[15]:=
```
N = 2 * 10^3; S0 = 9 * 10^2;  I0 = 10^2; R0 = N - S0 - I0;
Sol1 = NDSolve[{D[S[t], t] == mu * N - beta * S[t] * I[t] - mu * S[t], D[I[t], t] ==
      beta * S[t] * I[t] - (gamma + mu) * I[t], D[R[t], t] == gamma * I[t] - mu * R[t],
    S[0] == S0, I[0] == I0, R[0] == R0}, {S, I, R}, {t, 0, tend}];
```

In[17]:=
```
Plot11 = Plot[Evaluate[S[t] /. First[Sol1]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, S}, PlotRange → All, PlotStyle → Blue,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot21 = Plot[Evaluate[I[t] /. First[Sol1]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, I}, PlotRange → All, PlotStyle → Red,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot31 = Plot[Evaluate[R[t] /. First[Sol1]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, R}, PlotRange → All, PlotStyle → Green,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
MP1 = Show[Plot11, Plot21, Plot31, PlotRange → {{0, tend}, {0, 1500}}, Epilog →
    Inset[Column[{LineLegend[{Blue, Red, Green}, {"S", "I", "R"}, LabelStyle →
          {FontFamily → "Times New Roman", FontSize → 21, FontSlant → Italic}]}],
     Scaled[{0.85, 0.6}]], MaxRecursion → 0, PlotPoints → {200, 100},
  AspectRatio → 1, AxesOrigin → {0, 0}, RotateLabel → True,
  LabelStyle → {21, GrayLevel[0]}, FrameTicks →
   {{{0, 250, 500, 750, 1000, 1250, 1500}, None}, {{0, 0.5, 1, 1.5, 2}, None}},
  ImageSize → {450, 450}, AspectRatio → Full, PlotLabel → None,
  LabelStyle → {21, GrayLevel[0]}]
```

Out[20]=

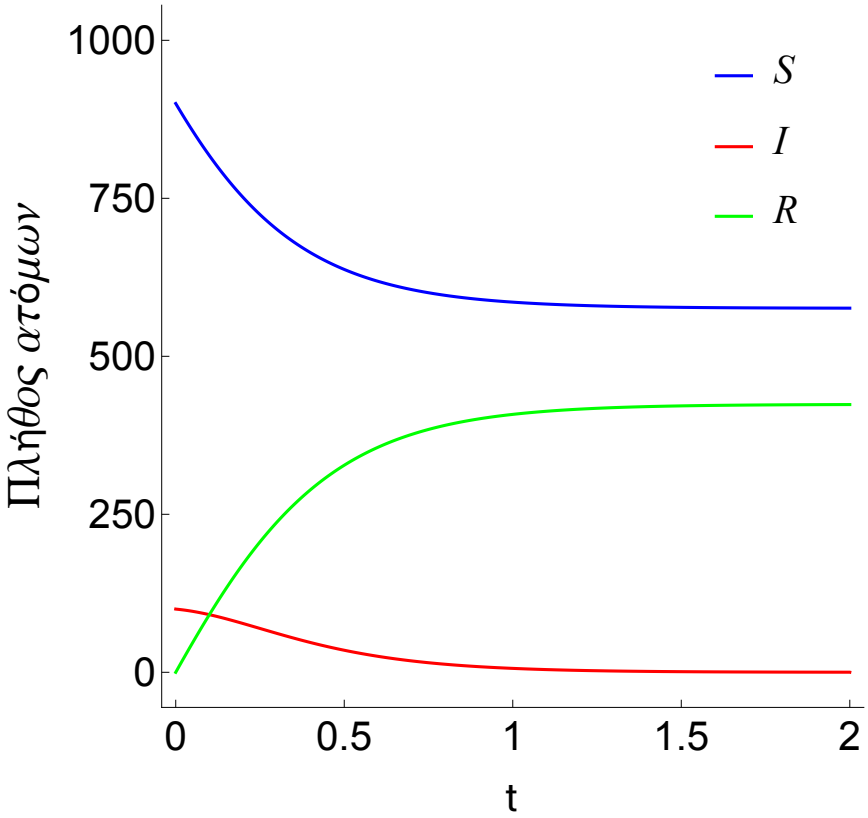


In[21]:=
```
N = 10^3; S0 = 9 * 10^2;  I0 = 10^2;  R0 = N - S0 - I0;
Sol2 = NDSolve[{D[S[t], t] == mu * N - beta * S[t] * I[t] - mu * S[t], D[I[t], t] ==
      beta * S[t] * I[t] - (gamma + mu) * I[t], D[R[t], t] == gamma * I[t] - mu * R[t],
    S[0] == S0, I[0] == I0, R[0] == R0}, {S, I, R}, {t, 0, tend}];
```

In[23]:=
```
Plot12 = Plot[Evaluate[S[t] /. First[Sol2]], {t, 0, tend}, PlotPoints → 200,
   Mesh → False, AxesLabel → {t, S}, PlotRange → All, PlotStyle → Blue,
   FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
     Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
   RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot22 = Plot[Evaluate[I[t] /. First[Sol2]], {t, 0, tend}, PlotPoints → 200,
   Mesh → False, AxesLabel → {t, I}, PlotRange → All, PlotStyle → Red,
   FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
     Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
   RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot32 = Plot[Evaluate[R[t] /. First[Sol2]], {t, 0, tend}, PlotPoints → 200,
   Mesh → False, AxesLabel → {t, R}, PlotRange → All, PlotStyle → Green,
   FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
     Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
   RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
```

In[26]:=
```
MP2 = Show[Plot12, Plot22, Plot32, PlotRange → {{0, tend}, {0, 1000}}, Epilog →
    Inset[Column[{LineLegend[{Blue, Red, Green}, {"S", "I", "R"}, LabelStyle →
          {FontFamily → "Times New Roman", FontSize → 21, FontSlant → Italic}]}],
     Scaled[{0.85, 0.8}]], MaxRecursion → 0, PlotPoints → {200, 100},
   AspectRatio → 1, AxesOrigin → {0, 0}, RotateLabel → True,
   LabelStyle → {21, GrayLevel[0]},
   FrameTicks → {{{0, 250, 500, 750, 1000}, None}, {{0, 0.5, 1, 1.5, 2}, None}},
   ImageSize → {450, 450}, AspectRatio → Full,
   PlotLabel → None, LabelStyle → {21, GrayLevel[0]}]
```

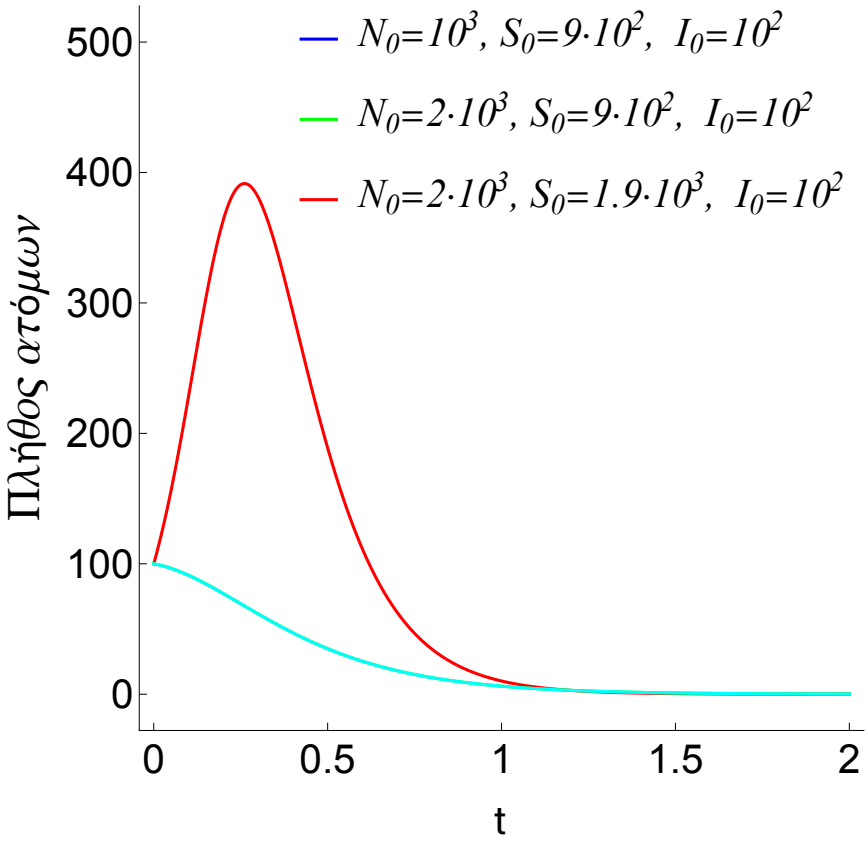
Out[26]=



In[27]:=
```
Plot21n = Plot[Evaluate[I[t] /. First[Sol1]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, I}, PlotRange → All, PlotStyle → Green,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
Plot22n = Plot[Evaluate[I[t] /. First[Sol2]], {t, 0, tend}, PlotPoints → 200,
    Mesh → False, AxesLabel → {t, I}, PlotRange → All, PlotStyle → Cyan,
    FrameLabel → {Style["t", FontFamily → "MS Serif", FontSize → 21],
      Style["Πλήθος ατόμων", FontFamily → "MS Serif", FontSize → 21]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
(* CenterDot · : https://
 reference.wolfram.com/language/ref/character/CenterDot.html*)
(* Style["\!\(\*SubscriptBox[\(N\), \(P\)]\) g/m2",13]}],
```

```
    Style["\!\(\*SubscriptBox[\(N\), \(P\)]\) g/m2",13]}]  : https://
 community.wolfram.com/groups/-/m/t/831646*)
MP3 = Show[Plot20, Plot21n, Plot22n, PlotRange → {{0, tend}, {0, 500}},
  Epilog → Inset[Column[{LineLegend[{Blue, Green, Red},
       {"\!\(\*SubscriptBox[\(N\), \(0\)]\)=\!\(\*SuperscriptBox[\(10\),
          \(3\)]\), \!\(\*SubscriptBox[\(S\),
          \(0\)]\)=9·\!\(\*SuperscriptBox[\(10\),
          \(2\)]\),  \!\(\*SubscriptBox[\(I\),
          \(0\)]\)=\!\(\*SuperscriptBox[\(10\), \(2\)]\)",
        "\!\(\*SubscriptBox[\(N\), \(0\)]\)=2·\!\(\*SuperscriptBox[\(10\),
          \(3\)]\), \!\(\*SubscriptBox[\(S\),
          \(0\)]\)=9·\!\(\*SuperscriptBox[\(10\),
          \(2\)]\),  \!\(\*SubscriptBox[\(I\),
          \(0\)]\)=\!\(\*SuperscriptBox[\(10\), \(2\)]\)",
        "\!\(\*SubscriptBox[\(N\), \(0\)]\)=2·\!\(\*SuperscriptBox[\(10\),
          \(3\)]\), \!\(\*SubscriptBox[\(S\),
          \(0\)]\)=1.9·\!\(\*SuperscriptBox[\(10\),
          \(3\)]\),  \!\(\*SubscriptBox[\(I\),
          \(0\)]\)=\!\(\*SuperscriptBox[\(10\), \(2\)]\)"},
       LabelStyle → {FontFamily → "Times New Roman", FontSize → 21,
         FontSlant → Italic}]}],
    Scaled[{0.6, 0.85}]], MaxRecursion →
   0,
  PlotPoints →
   {200,
    100},
  AspectRatio →
   1,
  AxesOrigin →
   {0,
    0},
  RotateLabel →
   True,
  LabelStyle →
   {21,
    GrayLevel[
     0]},
  FrameTicks → {{{0, 100, 200, 300, 400, 500},
     None}, {{0, 0.5, 1, 1.5, 2},
     None}},
  ImageSize → {450, 450}, AspectRatio → Full,
  PlotLabel →
   None,
  LabelStyle →
   {21,
    GrayLevel[0]}]
```

Out[29]=


$N_0=10^3,\ S_0=9\cdot10^2,\ I_0=10^2$
$N_0=2\cdot10^3,\ S_0=9\cdot10^2,\ I_0=10^2$
$N_0=2\cdot10^3,\ S_0=1.9\cdot10^3,\ I_0=10^2$
Πλήθος ατόμων
500
400
300
200
100
0
0
0.5
1
1.5
2
t