

```

f[t_, y_] := y^3 * t - y * t^3
(*f[t_, y_] := y * Exp[-(t-3)^2] *)
α = 1.;
tA = 0.0; tB = 1.2;
n = 800;
h = (tB - tA) / n;
t[0] = tA;
t[n] = tB;
Do[t[i + 1] = t[i] + h, {i, 0, n - 1}]
w[0] = α;

(* EULERO *)
Do[w[i + 1] = w[i] + h * f[t[i], w[i]], {i, 0, n - 1}];
sol = Table[{t[i], w[i]}, {i, 0, n}];
solnum = NDSolve[{y'[t] == f[t, y[t]], y[tA] == α}, y[t], {t, tA, tB}][[1]];
soltrue = DSolve[{y'[t] == f[t, y[t]], y[tA] == α}, y[t], t][[1]]
trange = {tA, tB};
yrange = {0, 10};
pl0 = Plot[y[t] /. soltrue, {t, tA, tB}, PlotRange -> {trange, yrange}];
pl1 = ListPlot[sol, PlotRange -> {trange, yrange}];
pl2 = Plot[y[t] /. solnum, {t, tA, tB}, PlotRange -> {trange, yrange}];
(*pl3 =
  Plot[y[t] /. soltrue, {t, tA, tB}, PlotRange -> {trange, yrange}, PlotStyle -> RGBColor[1, 0, 0]; *)
Show[
  pl0,
  pl1,
  pl2]

```

General::ovfl: Overflow occurred in computation. >>

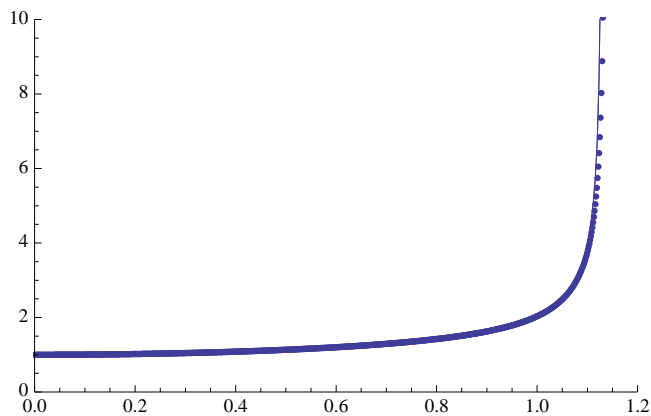
NDSolve::ndsz:

At t == 1.1294007156019532`, step size is effectively zero; singularity or stiff system suspected. >>

DSolve::bvnul:

For some branches of the general solution, the given boundary conditions lead to an empty solution. >>

$$\left\{ y[t] \rightarrow \frac{\sqrt{2}}{\sqrt{2. e^{\frac{t^4}{2}} - 2.50663 e^{\frac{t^4}{2}} \operatorname{Erf}\left[\frac{t^2}{\sqrt{2}}\right]}} \right\}$$



```

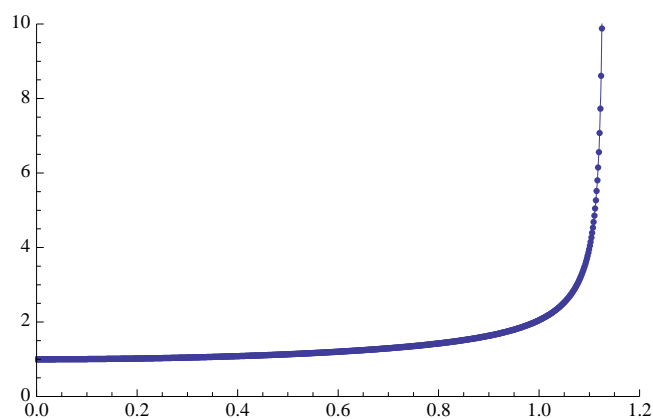
(* RK2 *)
Do[k1 = f[t[i], w[i]];
  k2 = f[t[i] + 0.5*h, w[i] + 0.5*h*k1]; w[i + 1] = w[i] + h*k2, {i, 0, n - 1}];
sol = Table[{t[i], w[i]}, {i, 0, n}];
solnum = NDSolve[{y'[t] == f[t, y[t]], y[tA] ==  $\alpha$ }, y[t], {t, tA, tB}][[1]];
(*soltrue=DSolve[{y'[t]==f[t,y[t]],y[tA]== $\alpha$ },y[t],t][[1]]*)
trange = {tA, tB};
yrange = {0, 10};
p11 = ListPlot[sol, PlotRange -> {trange, yrange}];
p12 = Plot[y[t] /. solnum, {t, tA, tB}, PlotRange -> {trange, yrange}];
(*p13=
  Plot[y[t] /. soltrue, {t, tA, tB}, PlotRange -> {trange, yrange}, PlotStyle -> RGBColor[1, 0, 0]; *)
Show[
  p11,
  p12]

```

General::ovfl: Overflow occurred in computation. >>

NDSolve::ndsiz:

At t == 1.1294007156019532`, step size is effectively zero; singularity or stiff system suspected. >>



```

(* RK4 *)
Do[k1 = f[t[i], w[i]];
  k2 = f[t[i] + 0.5*h, w[i] + 0.5*h*k1];
  k3 = f[t[i] + 0.5*h, w[i] + 0.5*h*k2]; k4 = f[t[i] + h, w[i] + h*k3];
  w[i+1] = w[i] + h*(k1 + 2*k2 + 2*k3 + k4) / 6., {i, 0, n-1}];
sol = Table[{t[i], w[i]}, {i, 0, n}];
solnum = NDSolve[{y'[t] == f[t, y[t]], y[tA] ==  $\alpha$ }, y[t], {t, tA, tB}][[1]];
(*soltrue=DSolve[{y'[t]==f[t,y[t]],y[tA]== $\alpha$ },y[t],t][[1]]*)
trange = {tA, tB};
yrange = {0, 10};
p11 = ListPlot[sol, PlotRange -> {trange, yrange}];
p13 = Plot[y[t] /. solnum, {t, tA, tB}, PlotRange -> {trange, yrange}];
(*p13=
  Plot[y[t] /. soltrue, {t, tA, tB}, PlotRange -> {trange, yrange}, PlotStyle -> RGBColor[1, 0, 0];*)
Show[
  p11,
  p13]

```

General::ovfl: Overflow occurred in computation. >>

NDSolve::ndsz:

At t == 1.1294007156019532`, step size is effectively zero; singularity or stiff system suspected. >>

