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(*Q:-Solve the following difeerential equations by using NDSolve.... usin
   pure function and non-pure function*)
(*1*)
(*non-pure function*)
deq1 = y''[x] - (1 - x^6) / (1 + x^6) Tanh[x] y[x] == Sin[x];
nsol1 = NDSolve[{deq1, y[0] == 1, y'[0] == 0}, y[x], {x, 0, 20}];
nsol1 = y[x] /. nsol1[[1]]
Plot[nsol1, {x, 0, 20}]

(*pure function*)
deq1 = y''[x] - (1 - x^6) / (1 + x^6) Tanh[x] y[x] == Sin[x];
nsol1 = NDSolve[{deq1, y[0] == 1, y'[0] == 0}, y, {x, 0, 20}];
nsol1 = y[x] /. nsol1[[1]]
Plot[nsol1, {x, 0, 20}]

(*Q2:-The differential equation for a forced pendulum is given by θ''[t]+g/l Sin[θ[t]]==
   f[t] where f[t] is a forcing function.The initial conditions are θ[0]==
   0 and θ'[0]==0.Compute the following results:
  (a):-Solve the differential equation when the forcing function is f[t]=
 8Exp[-t/5]Sin[5t],g=l=9.8,(b):-Solve the Linearized differential equation*)
(*a*)
g = l = 9.8; f[t] = 8 Exp[-t / 5] Sin[5 t]; deq2 = θ''[t] + g / l Sin[θ[t]] == f[t];
nsol2 = NDSolve[{deq2, θ[0] == 0, θ'[0] == 0}, θ, {t, 0, 30}];
nlnsol2 = θ[t] /. nsol2[[1]]

(*b*)
g = l = 9.8; f[t] = 8 Exp[-t / 5] Sin[5 t]; deq2 = θ''[t] + g / l θ[t] == f[t];
nsol3 = NDSolve[{deq2, θ[0] == 0, θ'[0] == 0}, θ, {t, 0, 30}];
lnsol2 = θ[t] /. nsol3[[1]]
(*C*)
Plot[{nlnsol2, lnsol2}, {t, 0, 30}]
(*Phase Space Plot*)
ParametricPlot[{θ[t], θ'[t]} /. nsol3, {t, 0, 10}, PlotRange → All]
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