```
(*Solving differential equations numerically*)
(*Pure function solution*)
w = 1; deq = x''[t] + w^2 * x[t] == 0;
nsol = NDSolve[{deq, x'[0] == 0, x[0] == 1}, x[t], {t, 0, 10}];
nsol = x[t] /. nsol[[1]]
Plot[nsol, {t, 0, 10}]

(*Non-Pure function solution*)
w = 1; deq = x''[t] + w^2 * x[t] == 0;
nsol = NDSolve[{deq, x'[0] == 0, x[0] == 1}, x, {t, 0, 10}];
(*x[0.5]=?*)
xatp5 = x[0.5] /. nsol[[1]]
fderx = x'[0.5] /. nsol[[1]]
Plot[{x[t], x'[t], x''[t]} /. nsol[[1]], {t, 0, 10}]

(*exact solution and numerical solution*)
w = 1; deq = x''[t] + w^2 * x[t] == 0;
nsol = NDSolve[{deq, x'[0] == 0, x[0] == 1}, x[t], {t, 0, 10}];
sol = DSolve[{deq, x'[0] == 0, x[0] == 1}, x[t], t];
sol = x[t] /. sol[[1]]
nsol = x[t] /. nsol[[1]]
Plot[{nsol, sol}, {t, 0, 10}, PlotStyle → {{Red, Dashed}, {Blue, Dotted, Thick}}]
```