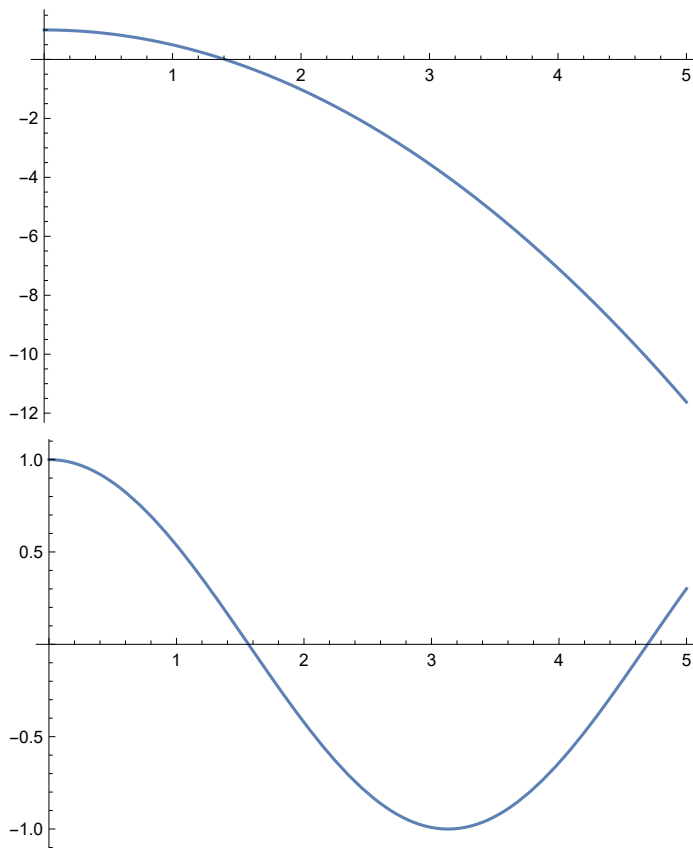


In[]:=

```
taska[sub_, a_, tmax_] := Module[{asyp, eqa},
  eqa = (x'[t] +  $\omega^2$  x[t] +  $\delta$  b x[t]^3 == 0) /. sub;
  asyp = Evaluate[AsymptoticDSolveValue[{eqa, x[0] == a, x'[0] == 0}, x[t], {t, 0, 2}]];
  Print[asyp];
  Print[Plot[asyp, {t, 0, tmax}]];
  Print[Plot[Evaluate[
    x[t] /. NDSolve[{eqa, x[0] == a, x'[0] == 0}, x, {t, 0, 5}][[1]], {t, 0, tmax}]]
]
```

In[]:= taska[{ $\omega \rightarrow 1$, $\delta \rightarrow 0.01$, $b \rightarrow 1$ }, 1, 5]

1. - 0.505 t²

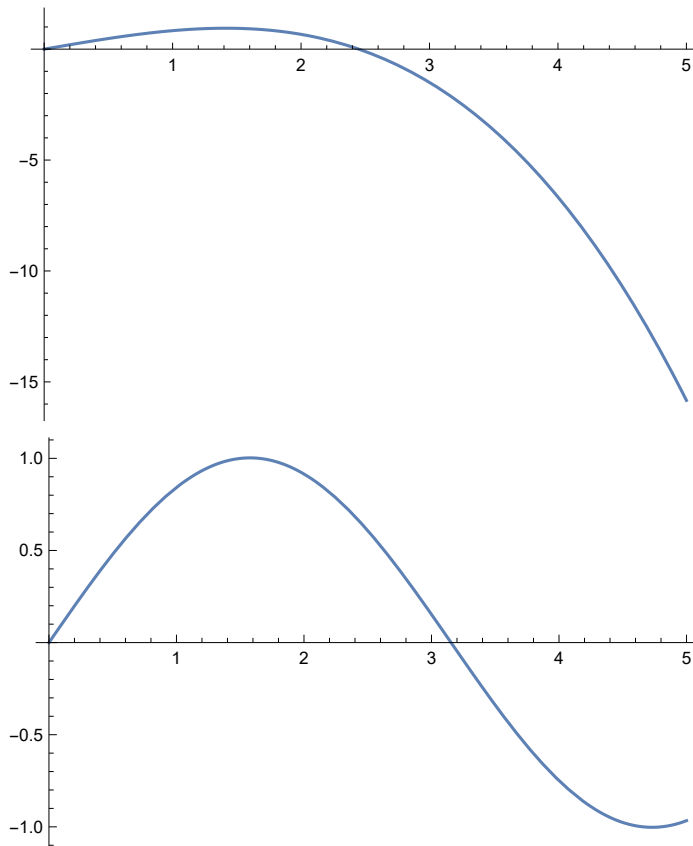


In[13] :=

```
taskb[sub_, v0_, tmax_, deg_] := Module[{asyp, eqa},
  eqa = (x'[t] +  $\omega^2$  x[t] -  $\delta$  b x[t]^3 == 0) /. sub;
  asyp =
    Evaluate[AsymptoticDSolveValue[{eqa, x[0] == 0, x'[0] == v0}, x[t], {t, 0, deg}]];
  Print[asyp];
  Print[Plot[asyp, {t, 0, tmax}]];
  Print[Plot[Evaluate[
    x[t] /. NDSolve[{eqa, x[0] == 0, x'[0] == v0}, x, {t, 0, 5}][[1]], {t, 0, tmax}]]
]
```

```
In[15]:= taskb[{ $\omega \rightarrow 1$ ,  $\delta \rightarrow 0.01$ ,  $b \rightarrow 1$ }, 1, 5, 4]
```

```
t - 0.166667 t3
```



```
taskc[sub_, tmax_, deg_] := Module[{asyp, eqa},
  eqa = {t x'[t] == x +  $\delta$  y[t], t y'[t] == (2 - x[t]) y[t]} /. sub;
  asyp = Evaluate[
    AsymptoticDSolveValue[{eqa, x[0] == 0, x'[0] == v0}, {x[t], y[t]}, {t, 0, deg}]];
  Print[asyp];
  Print[Plot[asyp, {t, 0, tmax}]];
  Print[Plot[Evaluate[
    x[t] /. NDSolve[{eqa, x[0] == 0, x'[0] == v0}, , {x[t], y[t]}, {t, 0, 5}][[1]], {t,
    0, tmax}]]
]
```

```
In[ ]:= taskc[{ $\delta \rightarrow 0.01$ }, 5, 4]
```

```
Set: Tag Times in t x'[t] is Protected.
```

```
Set: Tag Times in t y'[t] is Protected.
```

```
AsymptoticDSolveValue[
  {{x + 0.01 y[t], (2 - x[t]) y[t]}, x[0] == 0, x'[0] == v0}, {x[t], y[t]}, {t, 0, 4}]
```

```
AsymptoticDSolveValue: 0.00010214285714285715` is not a valid variable.
```

```
AsymptoticDSolveValue: Approximation order specification 4.` should be a positive integer.
```

AsymptoticDSolveValue: 0.10214295918367347` is not a valid variable.

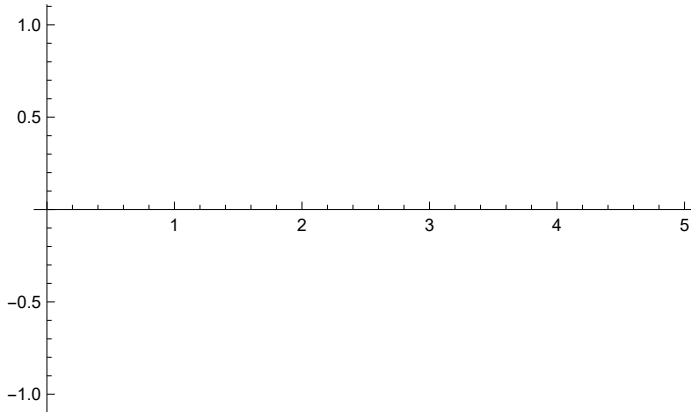
AsymptoticDSolveValue: Approximation order specification 4.` should be a positive integer.

AsymptoticDSolveValue: 0.20418377551020409` is not a valid variable.

General: Further output of AsymptoticDSolveValue::asvar will be suppressed during this calculation.

AsymptoticDSolveValue: Approximation order specification 4.` should be a positive integer.

General: Further output of AsymptoticDSolveValue::aord will be suppressed during this calculation.



NDSolve: Equation or list of equations expected instead of $x + 0.01 y[t]$ in the first argument

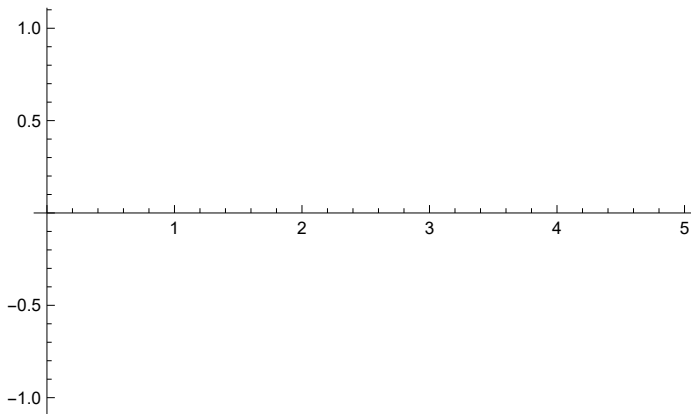
$\{x + 0.01 y[t], (2 - x[t]) y[t]\}, x[0] == 0, x'[0] == v0\}$.

ReplaceAll: Elements of $\{x + 0.01 y[t], (2 - x[t]) y[t], x[0] == 0, x'[0] == v0\}$ are a mixture of lists and nonlists.

ReplaceAll: Elements of $\{x + 0.01 y[0.000102143], (2 - x[0.000102143]) y[0.000102143]\}, x[0] == 0, x'[0] == v0\}$ are a mixture of lists and nonlists.

ReplaceAll: Elements of $\{x + 0.01 y[0.000102143], (2 - 1. x[0.000102143]) y[0.000102143]\}, x[0.] == 0., x'[0.] == v0\}$ are a mixture of lists and nonlists.

General: Further output of ReplaceAll::rmix will be suppressed during this calculation.



In[5]:=

eqa = {t x'[t] == x[t] + δ y[t], t y'[t] == (2 - x[t]) y[t]} /. { $\delta \rightarrow 0.01$ }

Out[5]= {t x'[t] == x[t] + 0.01 y[t], t y'[t] == (2 - x[t]) y[t]}

```

In[11]:= Evaluate[
  AsymptoticDSolveValue[Join[eqa, {x[1] == 1, y[1] == 1 / E}], {x[t], y[t]}, {t, 0, 4}]]
Out[11]= AsymptoticDSolveValue[ $\left\{t x'[t] == x[t] + 0.01 y[t],\right.$ 
   $\left. t y'[t] == (2 - x[t]) y[t], x[1] == 1, y[1] == \frac{1}{e}\right\}, \{x[t], y[t]\}, \{t, 0, 4\}]$ 

```