In[18]:=
```
omega := 10;
m := 4;
epsilon := 0.5;
f[x_] := -Sin[omega * x] - m * x
oldf[x_] := -4 * x
```

In[23]:=
```
v[x_] :=  Integrate[ -f[t]*(-t), {t, 0, x} ] + Integrate[ -f[t]*(-x), {t, x, 1} ];
Simplify[v[x]]
```

Out[24]= $-2\,x + \frac{2\,x^3}{3} + \frac{1}{10}\,x\,\text{Cos}[10] - \frac{1}{100}\,\text{Sin}[10\,x]$

In[25]:=
```
u[x_] := v[x] + epsilon * x + 1
```

In[26]:=
```
Simplify[u[x]]
```

Out[26]= $1. - 1.58391\,x + 0.666667\,x^3 - 0.01\,\text{Sin}[10\,x]$

In[27]:=
```
Simplify[D[u[x], x]]
```

Out[27]= $-1.58391 + 2.\,x^2 - 0.1\,\text{Cos}[10\,x]$

In[28]:=

In[29]:=
```
v[0] // N
D[v[x], x] /. x → 1 // N
Simplify[D[D[v[x], x], x] + f[x]]
```

Out[29]= 0.

Out[30]= -4.44089×10^{-16}

Out[31]= 0

In[32]:=
```
u[0] // N
D[u[x], x] /. x → 1 // N
Simplify[D[D[u[x], x], x] + f[x]]
```

Out[32]= 1.

Out[33]= 0.5

Out[34]= 0