```
ClearAll[f1, f2, c1, c2]
```

```
f1[x_] = x - x^2 / 2 / L
f2[x_] = x - x^3 / 3 / L^2
```

$$x - \frac{x^2}{2\,L}$$

$$x - \frac{x^3}{3\,L^2}$$

```
u[x] = c1 f1[x] + c2 f2[x]
```

$$c1\left(x - \frac{x^2}{2\,L}\right) + c2\left(x - \frac{x^3}{3\,L^2}\right)$$

```
A = Table[0, {i, 1, 2}, {j, 1, 2}];
```

```
A[[1]][[1]] = -EA Integrate[f1''[x] f1[x], {x, 0, L}];
A[[1]][[2]] = -EA Integrate[f1''[x] f2[x], {x, 0, L}];
A[[2]][[1]] = -EA Integrate[f2''[x] f1[x], {x, 0, L}];
A[[2]][[2]] = -EA Integrate[f2''[x] f2[x], {x, 0, L}];
```

```
MatrixForm[A]
```

$$\begin{pmatrix} \frac{EA\,L}{3} & \frac{5\,EA\,L}{12} \\ \frac{5\,EA\,L}{12} & \frac{8\,EA\,L}{15} \end{pmatrix}$$

```
g[x_] = a x
```

$$a\,x$$

```
q = Table[0, {i, 1, 2}];
```

```
q[[1]] = Integrate[g[x] f1[x], {x, 0, L}];
q[[2]] = Integrate[g[x] f2[x], {x, 0, L}];
```

```
MatrixForm[q]
```

$$\begin{pmatrix} \frac{5\,a\,L^3}{24} \\ \frac{4\,a\,L^3}{15} \end{pmatrix}$$

```
c = LinearSolve[A, q]
```

$$\left\{0,\ \frac{a\,L^2}{2\,EA}\right\}$$

```
c1 = %[[1]];
c2 = %%[[2]];
```

```
u[x] // Factor
```

$$\frac{a\,x\left(3\,L^2 - x^2\right)}{6\,EA}$$