```
ClearAll[c1, c2, a, EA, L]

f1[x_] := x
f2[x_] := x^2

u[x_] := c1 f1[x] + c2 f2[x]


F = EA / 2 Integrate[u'[x]^2, {x, 0, L}] - Integrate[a x u[x], {x, 0, L}]
```

$$-\frac{1}{3} a\, c1\, L^3 - \frac{1}{4} a\, c2\, L^4 + \frac{1}{2} EA \left(c1^2\, L + 2\, c1\, c2\, L^2 + \frac{4\, c2^2\, L^3}{3} \right)$$

```
Solve[{D[F, c1] == 0, D[F, c2] == 0}, {c1, c2}]
```

$$\left\{\left\{c1 \to \frac{7\, a\, L^2}{12\, EA},\ c2 \to -\frac{a\, L}{4\, EA}\right\}\right\}$$

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

$$\frac{7\, a\, L^2}{12\, EA}$$

$$-\frac{a\, L}{4\, EA}$$

```
u[x]
```

$$\frac{7\, a\, L^2\, x}{12\, EA} - \frac{a\, L\, x^2}{4\, EA}$$

```
u[L / 2]
```

$$\frac{11\, a\, L^3}{48\, EA}$$

```
u[L]
```

$$\frac{a\, L^3}{3\, EA}$$

```
a = 3;
L = 10;
EA = 100;

Plot[u[x], {x, 0, L}]
```