Elasticity Problem

In[1]:=
```
Em = 1;(*Em_0 = 119, Young's modulus*)
ν = 1 / 3; (*Poisson's ratio*)
λ = Em ν / (1 + ν) / (1 - 2 ν) (*Lamé first parameter*)
μ = Em / 3 / (1 - 2 ν)(*Lamé second parameter, Shear modulus*)
```

Out[2]= $\frac{3}{4}$

Out[3]= 1

In[4]:=
```
u1[x_, y_] = Exp[x + y - 1];
u2[x_, y_] = Exp[x - y + 1];
f1[x_, y_] = -((λ + 2 μ) D[u1[x, y], {x, 2}] +
      (λ + μ) D[D[u2[x, y], {x, 1}], {y, 1}] + μ D[u1[x, y], {y, 2}]);
f2[x_, y_] = -((λ + 2 μ) D[u2[x, y], {y, 2}] +
      (λ + μ) D[D[u1[x, y], {x, 1}], {y, 1}] + μ D[u2[x, y], {x, 2}]);
Simplify[f1[x, y]]
Simplify[f2[x, y]]
```

Out[8]= $\frac{7}{4} e^{1+x-y} - \frac{15}{4} e^{-1+x+y}$

Out[9]= $-\frac{15}{4} e^{1+x-y} - \frac{7}{4} e^{-1+x+y}$

In[10]:=
```
{u1[0, y], u2[0, y]}
{u1[1, y], u2[1, y]}
{u1[x, 0], u2[x, 0]}
{u1[x, 1], u2[x, 1]}
```

Out[10]= $\left\{e^{-1+y}, e^{1-y}\right\}$

Out[11]= $\left\{e^{y}, e^{2-y}\right\}$

Out[12]= $\left\{e^{-1+x}, e^{1+x}\right\}$

Out[13]= $\{e^{x}, e^{x}\}$

In[14]:=
```
{u1[0, 0], u2[0, 0]}
{u1[0, 1], u2[0, 1]}
{u1[1, 0], u2[1, 0]}
{u1[1, 1], u2[1, 1]}
```

Out[14]= $\left\{\frac{1}{e}, e\right\}$

Out[15]= $\{1, 1\}$

Out[16]= $\left\{1, e^{2}\right\}$

Out[17]= $\{e, e\}$