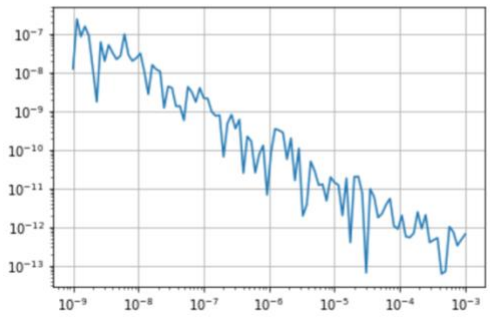
---- LINEAR

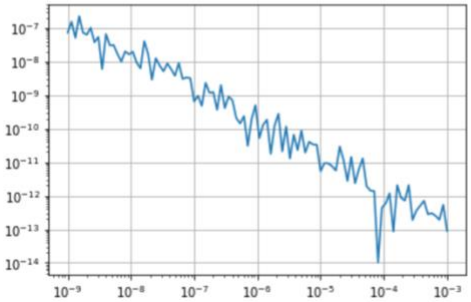
Validate Elastic Energy Gradient (Elastic Forces) using Finite Differences on Elastic Energy

```
: fd_validation_elastic(solid)
```



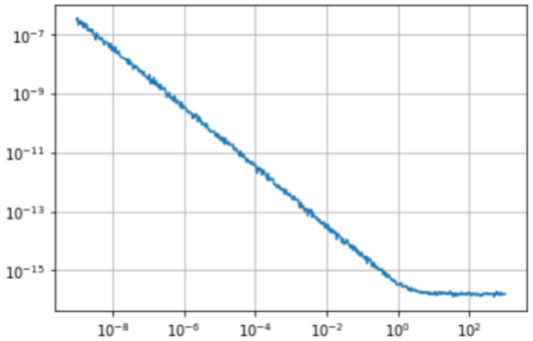
Validate External Energy Gradient (External Forces) using Finite Differences on External Energy

```
fd_validation_ext(solid)
```



Validate Elastic Energy Force Differentials (Elastic Forces) using Finite Differences on Elastic Forces

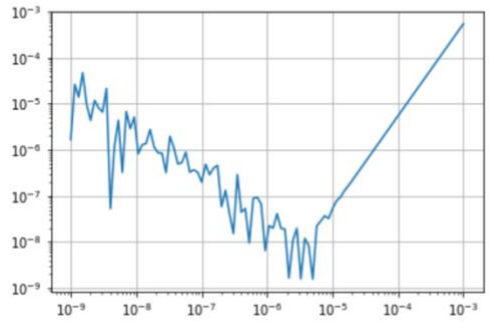
```
: %run ../src/Utils.py

v_def = v.copy()
v_def[:, 0] *= 2.
solid.update_def_shape(v_def)

fd_validation_elastic_differentials(solid)
```



---- NEO-HOOKEAN

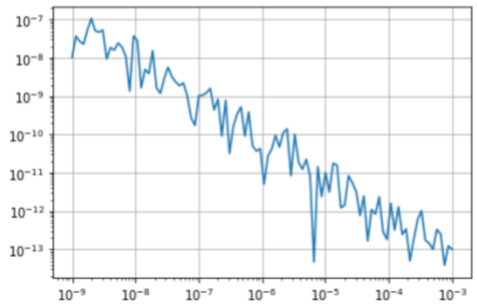
Validate Elastic Energy Gradient (Elastic Forces) using Finite Differences on Elastic Energy

```
: fd_validation_elastic(solid)
```



Validate External Energy Gradient (External Forces) using Finite Differences on External Energy

```
: fd_validation_ext(solid)
```



Validate Elastic Energy Force Differentials (Elastic Forces) using Finite Differences on Elastic Forces

```
%run ../src/Utils.py

v_def = v.copy()
v_def[:, 0] *= 2.
solid.update_def_shape(v_def)

fd_validation_elastic_differentials(solid)
```

```
/Users/narekalvandan/epfl/1_year/geometric_computing/cs457-2021-narekvslife/assignment_2_3/notebook/../sr
nergy.py:142: RuntimeWarning: invalid value encountered in log
  self.psi = 0.5 * self.mu * (I1 - 3) - self.mu * np.log(J) + 0.5 * self.lbda * np.log(J) ** 2
/Users/narekalvandan/epfl/1_year/geometric_computing/cs457-2021-narekvslife/assignment_2_3/notebook/../sr
nergy.py:154: RuntimeWarning: invalid value encountered in log
  self.logJ = np.log(J)
```