

```
In[*]:= Clear["Global`*"];
```

1. Readme

1. The integral kernels are focused, i.e. $\int_{z1}^{z2} \int_{\lambda1}^{\lambda2} \int_{r1}^{r2} \square dr' d\lambda' dz'$ should be added for the below expressions.
2. The kernels' formulas of the GC in Table 3 are represented as the following PhyVrrr, PhyVrrλ, PhyVrrz, PhyVλλr, PhyVλλλ, PhyVλλz, PhyVzzr, PhyVzzλ, and PhyVzzz.
3. (r, λ, z) and (r3, λ3, z3) (i.e. (r', λ', z')) are the cylindrical coordinates of the computation and integration points.

2. Test Laplace's equation for the GC in Table 3

```
In[*]:= l = Sqrt[r^2 + r3^2 - 2 * r * r3 * Cos[λ - λ3] + (z - z3)^2];
```

```
In[*]:= PhyVrrr = 3 * G * ρ * r3 * (r - r3 * Cos[λ - λ3]) * (3 * l^2 - 5 * (r - r3 * Cos[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVrrλ = -3 * G * ρ * r3^2 * Sin[λ - λ3] * (4 * l^2 - 5 * (z - z3)^2 - 5 * r3^2 * (Sin[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVrrz = 3 * G * ρ * r3 * (z - z3) * (l^2 - 5 * (r - r3 * Cos[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVλλr = 3 * G * ρ * r3 * (r - r3 * Cos[λ - λ3]) * (l^2 - 5 * r3^2 * (Sin[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVλλλ = 3 * G * ρ * r3^2 * Sin[λ - λ3] * (3 * l^2 - 5 * r3^2 * (Sin[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVλλz = 3 * G * ρ * r3 * (z - z3) * (l^2 - 5 * r3^2 * (Sin[λ - λ3])^2) / l^7;
```

```
In[*]:= PhyVzzr = 3 * G * ρ * r3 * (r - r3 * Cos[λ - λ3]) * (l^2 - 5 * (z - z3)^2) / l^7;
```

```
In[*]:= PhyVzzλ = 3 * G * ρ * r3^2 * Sin[λ - λ3] * (l^2 - 5 * (z - z3)^2) / l^7;
```

```
In[*]:= PhyVzzz = 3 * G * ρ * r3 * (z - z3) * (3 * l^2 - 5 * (z - z3)^2) / l^7;
```

```
In[*]:= Laplace1 = FullSimplify[PhyVrrr + PhyVλλr + PhyVzzr]
```

```
Out[*]=
0
```

```
In[*]:= Laplace2 = FullSimplify[PhyVrrλ + PhyVλλλ + PhyVzzλ]
```

```
Out[*]=
0
```

```
In[*]:= Laplace3 = FullSimplify[PhyVrrz + PhyVλλz + PhyVzzz]
```

```
Out[*]=
0
```

```
In[*]:= NotebookSave[EvaluationNotebook[]];
```