

```
In[•]:= eulerStepSymplectic[h_, Q_, B_, ephCoords_] :=
```

```
Module[{R0, θ0, ϕ0, BR0, Bθ0, Bϕ0, R1, θ1, ϕ1, BR1, Bθ1, Bϕ1, Rk1, θk1, ϕk1},
```

```
{R0, θ0, ϕ0} = Q;
```

```
{BR0, Bθ0, Bϕ0} = B;
```

```
{Rk1, θk1, ϕk1} = ephCoords;
```

```
R1 = R0 + h (BR0);
```

```
θ1 = θ0 + h  $\left( \frac{B\theta0}{R1^2} \right);$ 
```

```
ϕ1 = ϕ0 + h  $\left( \frac{B\phi0}{R1^2 \sin[\theta1]^2} \right);$ 
```

```
BR1 = BR0 + h  $\left( \frac{B\theta0^2}{R1^3} + \frac{B\phi0^2}{R1^3 \sin[\theta1]^2} + \text{Total} \left[ \frac{\eta k (-R1 + Rk1 (\cos[\theta1] \cos[\theta k1] + \sin[\theta1] \sin[\theta k1] \cos[\phi1 - \phi k1]))}{(R1^2 + Rk1^2 - 2 R1 Rk1 (\cos[\theta1] \cos[\theta k1] + \sin[\theta1] \sin[\theta k1] \cos[\phi1 - \phi k1]))^{3/2}} \right] \right);$ 
```

```
Bθ1 = Bθ0 + h  $\left( \frac{B\phi0^2}{R1^2 \sin[\theta1]^2 \tan[\theta1]} + \text{Total} \left[ \frac{\eta k (R1 Rk1 (-\sin[\theta1] \cos[\theta k1] + \cos[\theta1] \sin[\theta k1] \cos[\phi1 - \phi k1]))}{(R1^2 + Rk1^2 - 2 R1 Rk1 (\cos[\theta1] \cos[\theta k1] + \sin[\theta1] \sin[\theta k1] \cos[\phi1 - \phi k1]))^{3/2}} \right] \right);$ 
```

```
Bϕ1 = Bϕ0 + h  $\left( \text{Total} \left[ \frac{\eta k (-R1 Rk1 \sin[\theta1] \sin[\theta k1] \sin[\phi1 - \phi k1])}{(R1^2 + Rk1^2 - 2 R1 Rk1 (\cos[\theta1] \cos[\theta k1] + \sin[\theta1] \sin[\theta k1] \cos[\phi1 - \phi k1]))^{3/2}} \right] \right);$ 
```

```
{{R1, θ1, ϕ1}, {BR1, Bθ1, Bϕ1}}
```

```
]
```