```
restart ;

#Initialize linear algebra
with(LinearAlgebra) :
with(CodeGeneration) :
```

#Import expressions from other worksheets:

```
read "../Impact_map/impact_map.m";
read  "../Equations_of_motion/eom.m";
```

#Solve for relations:

$$g0 := g = a;$$
$$c0 := c = -a - 2 \cdot \mathrm{psi};$$
$$e0 := e = -a - 2 \cdot \mathrm{psi};$$

$$update := MatrixInverse(rhs(Qp0)).rhs(Qn0) :$$
$$update := subs(q1 = c, q2 = g, update) :$$
$$update := Vector([b, f]) = simplify(subs(c = rhs(c0), g = rhs(g0), update.Vector([d, h])));$$

$$h0 := collect\left(simplify(h = solve(simplify(update(1)), h)), \left[b, d, \cos\left(2\,a + 2\,\psi\right)\right]\right);$$
$$f0 := simplify(subs(h = rhs(h0), simplify(update(2))));$$

#Insert into energy:

$$E := K0 + P0 :$$

$$Ev := E0 = collect\left(subs(q1 = \mathrm{theta}(t), q2 = \mathrm{phi}(\mathrm{theta}(t)), Dq1 = diff(\mathrm{theta}(t), t), Dq2 = diff(\mathrm{phi}(\mathrm{theta}(t)), t), E), \left[\left(\frac{\mathrm{d}}{\mathrm{d}t}\,\theta(t)\right)^2\right]\right);$$

$$E0ab := \left(subs\left(\frac{\mathrm{d}}{\mathrm{d}t}\,\theta(t) = b, \mathrm{D}(\phi)(\theta(t)) = \frac{f}{b}, \theta(t) = a, \phi(\mathrm{a}) = e, rhs(Ev)\right)\right);$$

$$E0cd := \left(subs\left(\frac{\mathrm{d}}{\mathrm{d}t}\,\theta(t) = d, \mathrm{D}(\phi)(\theta(t)) = \frac{h}{d}, \theta(t) = c, \phi(\mathrm{c}) = g, rhs(Ev)\right)\right);$$

#Reducing energy parameters:

$$E0d1 := subs(h = rhs(h0), c = rhs(c0), g = rhs(g0), E0cd) :$$
$$E0d2 := subs(f = rhs(f0), e = rhs(e0), g = rhs(g0), E0ab) :$$
$$E0d := collect\left(E0d1 - E0d2, \left[d^2, d\right]\right);$$
$$A2 := coeff\left(E0d, d^2\right);$$
$$B2 := coeff\left(E0d, d\right);$$
$$C2 := subs(d = 0, E0d);$$

#Creating Matlab code

```
Matlab(rhs(g0), resultname='g');
```

```
Matlab(rhs(c0), resultname ='c');
Matlab(rhs(f0), resultname ='f');
Matlab(rhs(h0), resultname ='h');


Matlab(E0ab, resultname ='E0ab');
Matlab(E0cd, resultname ='E0cd');
Matlab(E0d, resultname ='E0d');


Matlab(A2, resultname ='A2');
Matlab(B2, resultname ='B2');
Matlab(C2, resultname ='C2');
```