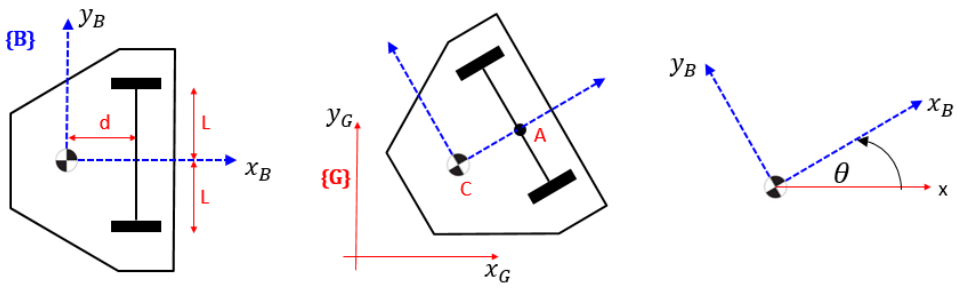
Derive the equations of motion of a Differential Drive Mobile Robot:

In this script we derive the equations of motion for a Differential Drive Robot (DDR). The approach taken is to apply Newton's second law. The modelling assumptions made, include:

- the vehicle can NOT slide in the direction of the BODY fixed Y-axis, ie: ${}^{B}_{G}v_{\mathrm{Ay}} = 0$.
- the wheels rotate without slipping.
- the vehicle is a 2 degree of freedom (dof) system, characterised by the orentation angle θ, and the velocity of the vehicle's centre of mass ${}^{B}_{G}v_{\mathrm{Cx}}$ along the X-axis of the vehicle's body frame.



Extensive use is made of the Symbolic toolbox throughout this derivation. After deriving the vehicle's equations of motion, these equations are automatically converted into a MATLAB function block for Simulink. This block can then be placed inside a Simulink model:

- **bh_DDR_component_model.slx**

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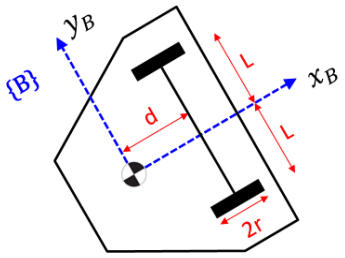
Equations of motion according to a body fixed frame:

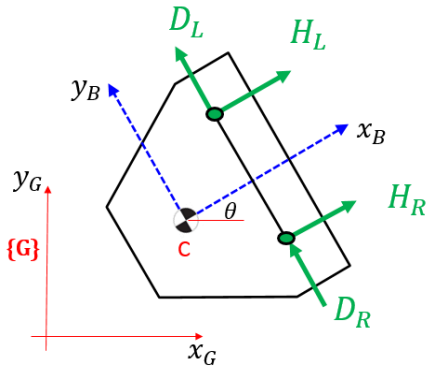
Recall our fundamental equations of motion for a RIGID body - these equations are expressed in the body fixed {B}-frame:

$$ {}^{B}F = m.({}^{B}_{G}a) = m.(\ {}^{B}\dot{v} \ + \ {}^{B}\omega \times {}^{B}v \ ) $$

$$ {}^{B}M = {}^{B}I.{}^{B}\dot{\omega} \ + \ {}^{B}\omega \times ({}^{B}I \, . \, {}^{B}\omega) $$

So let's explore our FORCE equation:






```
syms t theta(t) v_xB(t) v_yB(t) m

theta_dot = diff(theta(t), t);

w_B      = sym([0,0,theta_dot]).' ;
v_B      = [v_xB(t), v_yB(t), 0].';
v_B_dot  = diff(v_B, t);
```

So our FORCE equation becomes:

```
F_B = m*(v_B_dot + cross(w_B, v_B) )
```

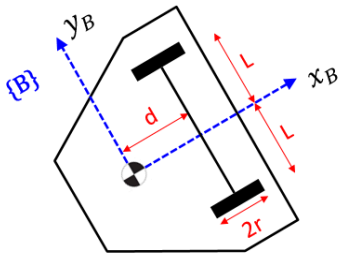
```
F_B =
```

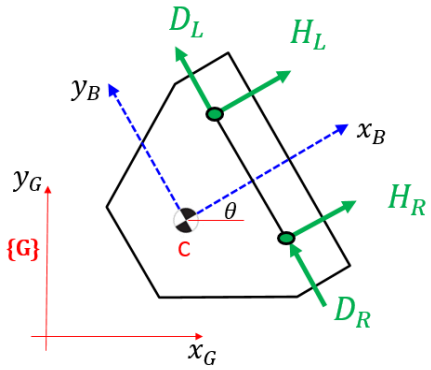
$$\begin{pmatrix} m\left(\frac{\partial}{\partial t}\,v_{xB}(t) - \overline{\frac{\partial}{\partial t}\,\theta(t)}\;\overline{v_{yB}(t)}\right) \\ m\left(\frac{\partial}{\partial t}\,v_{yB}(t) + \overline{\frac{\partial}{\partial t}\,\theta(t)}\;\overline{v_{xB}(t)}\right) \\ 0 \end{pmatrix}$$

If we focus on the XY plane we see that the FORCE equations for our differential drive mobile robot is:

- $$\begin{bmatrix} {}^{B}F_X \\ {}^{B}F_Y \end{bmatrix} = \begin{bmatrix} H_R + H_L \\ D_R + D_L \end{bmatrix} = m.\begin{bmatrix} {}^{B}_{G}a_{Cx} \\ {}^{B}_{G}a_{Cy} \end{bmatrix} = m.\begin{bmatrix} {}^{B}_{G}\dot{v}_{Cx} - \dot{\theta}.{}^{B}_{G}v_{Cy} \\ {}^{B}_{G}\dot{v}_{Cy} + \dot{\theta}.{}^{B}_{G}v_{Cx} \end{bmatrix} \quad \text{.....} \textbf{\textit{(1.)}}$$

Similarly let's consider our MOMENT equation:






```
syms I_xx I_xy I_xz I_yy I_yz I_zz

I       =  [ I_xx, I_xy, I_xz;
             I_xy, I_yy, I_yz;
             I_xz, I_yz, I_zz; ];

w_B_dot = [0,0, diff(theta(t),2)].' ;

M_B     = I*w_B_dot + cross(w_B, I*w_B)
```

```
M_B =
```

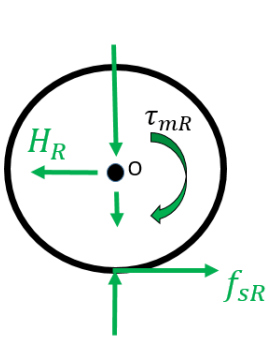
$$\begin{pmatrix} I_{xz}\frac{\partial^2}{\partial t^2}\,\theta(t) - \overline{\frac{\partial}{\partial t}\,\theta(t)}^{2}\,\overline{I_{yz}} \\ \overline{\frac{\partial}{\partial t}\,\theta(t)}^{2}\,\overline{I_{xz}} + I_{yz}\frac{\partial^2}{\partial t^2}\,\theta(t) \\ I_{zz}\frac{\partial^2}{\partial t^2}\,\theta(t) \end{pmatrix}$$

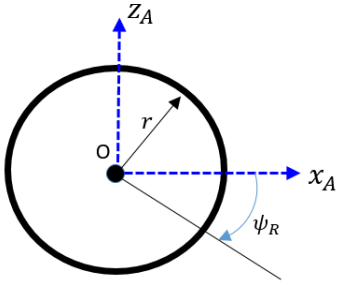
If we focus on the rotational motion about the Z-axis, we see that the TORQUE equation for our differential drive mobile robot is:

- $$M_{zB} = d.(D_L + D_R) + L.(H_R - H_L) = I_{zz}.\ddot{\theta}$$ ..... ***(2.)***

Focus on RIGHT wheel:

Consider the free body diagram of the RIGHT side wheel:



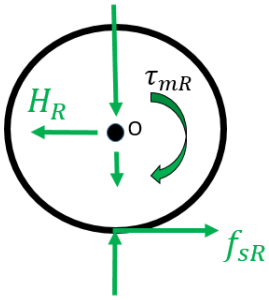


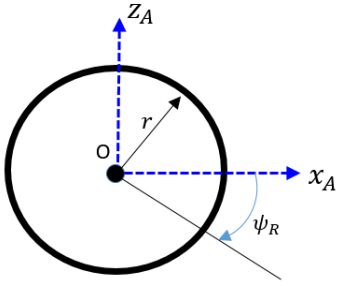
where:

- r : the wheel's radius
- ψ_R : the rotation angle of the wheel as measured from a body fixed frame at point A on the vehicle
- f_{sR} : the static friction acting on the wheel
- H_R : the reaction force applied from the vehicle body to the wheel shaft. An equal and opposite force will be applied from the wheel shaft back onto the vehicle
- τ_{mR} : the net torque applied to the wheel from an electric motor. $\tau_{\mathrm{mR}} = K_a.i - b.\dot{\psi}_R = \tau_{\mathrm{aR}} - b.\dot{\psi}_R$
- $\tau_{a\mathrm{R}}$: the applied motor torque $(= K_a.i)$
- K_{a} : the DC motor torque constant
- i : the DC motor curent
- b_R : the viscous damping co-efficient.
- m_R : the mass of the wheel
- I_{oR} : the combined inertia of the wheel and the motor shaft

We're also going to assume that there is NO slipping of the wheel, ie:

- $\boldsymbol{x_o = r.\psi_R}$, $\boldsymbol{\dot{x}_o = r.\dot{\psi}_R}$, $\boldsymbol{\ddot{x}_o = r.\ddot{\psi}_R}$





So NEWTON's force law says:

$$m_R \ddot{x}_o = \Sigma F = f_{\mathrm{sR}} - H_R$$

which we can write as:

$$m_R \,.\, \boldsymbol{r}.\, \ddot{\psi}_R = f_{\mathrm{sR}} - H_R$$

and then isolating f_{sR} we can write:

$$f_{\mathrm{sR}} = m_R \,.\, \boldsymbol{r}.\, \ddot{\psi}_{\boldsymbol{R}} + H_R \quad \text{.....} \ \textbf{\textit{(3.)}}$$

Next, let's explore NEWTON's torque law:

$$I_{\mathrm{oR}} \,.\, \ddot{\psi}_R = \Sigma M = \tau_{\mathrm{mR}} - r.\, f_{\mathrm{sr}}$$

and then isolating f_{sR} again we can write:

$$f_{\mathrm{sR}} = \left(\tau_{\mathrm{mR}} - I_{\mathrm{oR}} \,.\, \ddot{\psi}_R\right) \frac{1}{r} \quad \text{.....} \ \textbf{\textit{(4.)}}$$

so now we can equate (3.) and (4.) and then isolate H_{R} :

$$f_{\mathrm{sR}} = m_R \,.\, \boldsymbol{r}.\, \ddot{\psi}_R + H_R = \left(\tau_{\mathrm{mR}} - I_{\mathrm{oR}} \,.\, \ddot{\psi}_R\right) \frac{1}{r}$$

and therefore we can express H_{R} as:

$$H_{\mathrm{R}} = \left(\tau_{\mathrm{mR}} - I_{\mathrm{oR}} \,.\, \ddot{\psi}_R - m_R \,.\, r^2.\, \ddot{\psi}_R\right) \frac{1}{r}$$

The last modification that we'll make to the H_{R} equation is to make the following substitution for τ_{mR} :

- $\tau_{\mathrm{mR}} = K_a.\, i - b.\dot{\psi}_R = \tau_{\mathrm{aR}} - b.\dot{\psi}_R$:

Which then makes our H_R equation look like this:

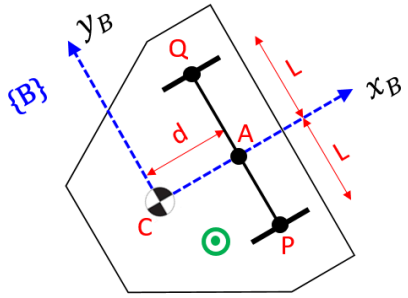
- $H_{\mathrm{R}} = \left(\tau_{\mathrm{aR}} - b_R.\dot{\psi}_R - I_{\mathrm{oR}} \,.\, \ddot{\psi}_R - m_R \,.\, r^2.\, \ddot{\psi}_R\right) \frac{1}{r}$ ..... ***(5.)***
- $f_{\mathrm{sR}} = m_R \,.\, \boldsymbol{r}.\, \ddot{\psi}_{\boldsymbol{R}} + H_R$

Now if we applied an identical analysis to the LEFT wheel, we would get:

- $f_{\mathrm{sL}} = m_L \,.\, \boldsymbol{r}.\, \ddot{\psi}_L + H_L$
- $H_L = \left(\tau_{\mathrm{aL}} - b_L.\dot{\psi}_L - I_{\mathrm{oL}} \,.\, \ddot{\psi}_L - m_L \,.\, r^2.\, \ddot{\psi}_L\right) \frac{1}{r}$ ..... ***(6.)***

Explore velocities, accelerations and constraints:

Consider the following schematic:



we're going to explore the velocities and accelerations of points A,Q and P. Specifically we'll define:

$$ {}^B_G\omega_B = \begin{bmatrix} 0 \\ 0 \\ \dot{\theta} \end{bmatrix} , \; {}^B_G\alpha_B = \begin{bmatrix} 0 \\ 0 \\ \ddot{\theta} \end{bmatrix} , \; {}^B_B r_{A|C} = \begin{bmatrix} d \\ 0 \\ 0 \end{bmatrix} , \; {}^B_B r_{Q|C} = \begin{bmatrix} d \\ L \\ 0 \end{bmatrix} , \; {}^B_B r_{P|C} = \begin{bmatrix} d \\ -L \\ 0 \end{bmatrix} $$

Also, we'll enforce a "NO lateral sliding" motion contraint on our model. This constraint can be represented by enforcing a zero BODY Y axis velocity at point A on the vehicle ie:

- ${}^B_G v_{\mathrm{Ay}} = 0$

Let's start with a clean slate:

```
clear
```

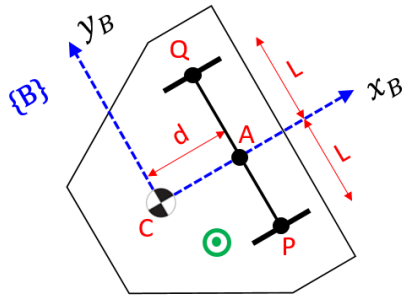
Define some symbols:

```
syms  a_Cx  a_Cy  a_Cz
syms  v_Cx  v_Cy  v_Cz
syms  d L theta_DOT  theta_DOT_DOT

v_C   = [v_Cx,  v_Cy,  v_Cz].';
a_C   = [a_Cx,  a_Cy,  a_Cz].';
omega = [0, 0, theta_DOT].';
alpha = [0, 0, theta_DOT_DOT].';

r_A = [d, 0, 0].';
r_Q = [d, L, 0].';
r_P = [d,-L, 0].';
```

For a rigid body, we know that we can describe the velocity of any point "$\odot$" iff we know information about the velocity of point C along with the ω of the body. And this relationship is described by the formula, where all vectors are expressed in components of the {B}-frame

- 

$$ {}^{B}_{G}v_{\odot} = {}^{B}_{G}v_{C} + \left({}^{B}_{G}\omega_{B} \times {}^{B}_{B}r_{\odot|C}\right) $$

Velocity of point A:

```
v_A = v_C + cross(omega, r_A)
```

v_A =

$$ \begin{pmatrix} v_{Cx} \\ v_{Cy} + \overline{d}\,\overline{\theta_{DOT}} \\ v_{Cz} \end{pmatrix} $$

Velocity of point Q:

```
v_Q = v_C + cross(omega, r_Q)
```

v_Q =

$$ \begin{pmatrix} v_{Cx} - \overline{L}\,\overline{\theta_{DOT}} \\ v_{Cy} + \overline{d}\,\overline{\theta_{DOT}} \\ v_{Cz} \end{pmatrix} $$

Velocity of point P:

```
v_P = v_C + cross(omega, r_P)
```

v_P =

$$ \begin{pmatrix} v_{Cx} + \overline{L}\,\overline{\theta_{DOT}} \\ v_{Cy} + \overline{d}\,\overline{\theta_{DOT}} \\ v_{Cz} \end{pmatrix} $$

Now ifff we wanted ${}^{B}_{G}v_{Ay} = 0$, then we would need to have:

- ${}^{B}_{G}v_{Cy} = -d.\dot{\theta}$

So let's apply this constraint to our velocities for A,Q,P:

```
v_A = subs(v_A, v_Cy, -d*theta_DOT);
v_Q = subs(v_Q, v_Cy, -d*theta_DOT);
```

```
v_P = subs(v_P, v_Cy, -d*theta_DOT);
```

So our velocities now look like this:

```
v_A
```

v_A =

$$\begin{pmatrix} v_{Cx} \\ \overline{d}\,\overline{\theta_{DOT}} - d\,\theta_{DOT} \\ v_{Cz} \end{pmatrix}$$

```
v_Q
```

v_Q =

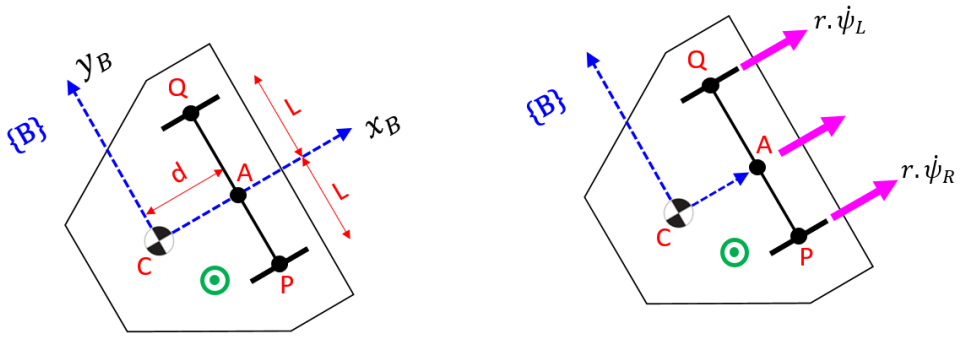
$$\begin{pmatrix} v_{Cx} - \overline{L}\,\overline{\theta_{DOT}} \\ \overline{d}\,\overline{\theta_{DOT}} - d\,\theta_{DOT} \\ v_{Cz} \end{pmatrix}$$

```
v_P
```

v_P =

$$\begin{pmatrix} v_{Cx} + \overline{L}\,\overline{\theta_{DOT}} \\ \overline{d}\,\overline{\theta_{DOT}} - d\,\theta_{DOT} \\ v_{Cz} \end{pmatrix}$$

There is something else we can say about the velocities of points A,P,Q ... and that's their relationship with the wheel rotation velocities $\dot{\psi}_L$ and $\dot{\psi}_R$:



So what we have is:

```
syms r psi_L_DOT  psi_R_DOT
EQ_vQ = r*psi_L_DOT == v_Q(1);
EQ_vP = r*psi_R_DOT == v_P(1);
```

And we can solve this set of equations. so solving for $\dot{\theta}$ and ${}^{B}_{G}v_{Cx}$:

```
v_sol_1 = solve([EQ_vQ, EQ_vP], [theta_DOT, v_Cx]);
```

so here's $\dot{\theta}$:

```
the_theta_DOT = v_sol_1.theta_DOT
```

```
the_theta_DOT =
```

$$-\frac{\overline{\psi_{L,\mathrm{DOT}}}\,\overline{r}-\overline{\psi_{R,\mathrm{DOT}}}\,\overline{r}}{2\,L}$$

so here's ${}_{G}^{B}v_{\mathrm{Cx}}$:

```
the_v_Cx = v_sol_1.v_Cx
```

```
the_v_Cx =
```

$$\frac{\psi_{L,\mathrm{DOT}}\,r}{2}+\frac{\psi_{R,\mathrm{DOT}}\,r}{2}$$

And similarly we could solve for $\dot{\psi}_R$ and $\dot{\psi}_L$:

```
v_sol_2 = solve([EQ_vQ, EQ_vP], [psi_R_DOT, psi_L_DOT]);
```

so here's $\dot{\psi}_R$:

```
the_psi_R_DOT = v_sol_2.psi_R_DOT
```

```
the_psi_R_DOT =
```

$$\frac{v_{\mathrm{Cx}}+\overline{L}\,\overline{\theta_{\mathrm{DOT}}}}{r}$$

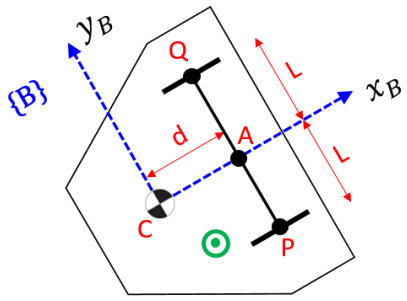
so here's $\dot{\psi}_L$:

```
the_psi_L_DOT = v_sol_2.psi_L_DOT
```

```
the_psi_L_DOT =
```

$$\frac{v_{\mathrm{Cx}}-\overline{L}\,\overline{\theta_{\mathrm{DOT}}}}{r}$$

Next let's explore **Accelerations**. Again here is our system schematic:



For a rigid body, we know that we can describe the acceleration of any point "$\odot$" iff we know information about the acceleration of point C along with the ω and α of the body. And this relationship is described by the formula, where all vectors are expressed in components of the {B}-frame

- $${}^{B}_{G}a_{\odot} = {}^{B}_{G}a_{C} + \left({}^{B}_{G}\alpha_{B} \times {}^{B}_{B}r_{\odot|C}\right) + {}^{B}_{G}\omega_{B} \times \left({}^{B}_{G}\omega_{B} \times {}^{B}_{B}r_{\odot|C}\right)$$

Acceleration of point A:

```
a_A = a_C + cross(alpha, r_A)  +  cross(omega, cross(omega, r_A) )
```

a_A =

$$\begin{pmatrix} a_{Cx} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} \\ a_{Cz} \end{pmatrix}$$

Acceleration of point Q:

```
a_Q = a_C + cross(alpha, r_Q)  +  cross(omega, cross(omega, r_Q) )
```

a_Q =

$$\begin{pmatrix} a_{Cx} - \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} - L\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cz} \end{pmatrix}$$

Acceleration of point P:

```
a_P = a_C + cross(alpha, r_P)  +  cross(omega, cross(omega, r_P) )
```

a_P =

$$\begin{pmatrix} a_{Cx} + \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} + L\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cz} \end{pmatrix}$$

We can insert into these acceleration expressions what we now know about ${}^{B}_{G}v_{Cy}$ and ${}^{B}_{G}a_{Cx}$:

- $${}^{B}_{G}a_{Cx} = {}^{B}_{G}\dot{v}_{Cx} - \dot{\theta}.\,{}^{B}_{G}v_{Cy}$$

- $${}^{B}_{G}v_{Cy} = -d.\dot{\theta}$$

```
syms v_Cx_DOT
a_A = subs(a_A, a_Cx, (v_Cx_DOT -theta_DOT*(-d*theta_DOT)) )
```

a_A =

$$\begin{pmatrix} v_{Cx,DOT} + d\,\theta_{DOT}^{2} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} \\ a_{Cz} \end{pmatrix}$$

```
a_Q = subs(a_Q, a_Cx, (v_Cx_DOT -theta_DOT*(-d*theta_DOT)) )
```

a_Q =

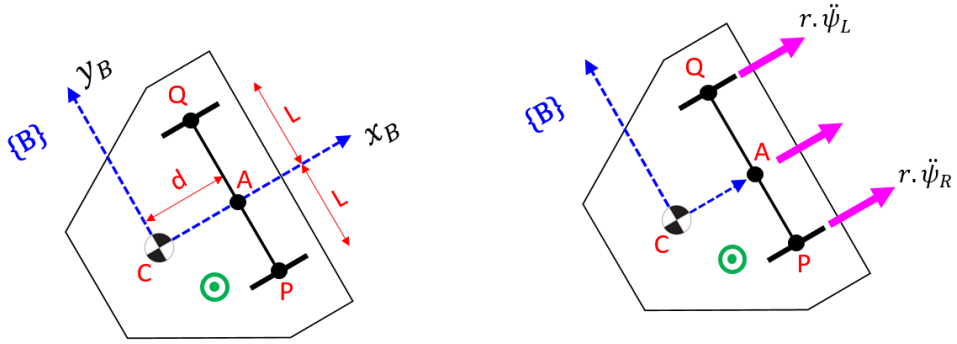
$$\begin{pmatrix} v_{Cx,DOT} + d\,\theta_{DOT}^{2} - \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} - L\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cz} \end{pmatrix}$$

```
a_P = subs(a_P, a_Cx, (v_Cx_DOT -theta_DOT*(-d*theta_DOT)) )
```

a_P =

$$\begin{pmatrix} v_{Cx,DOT} + d\,\theta_{DOT}^{2} + \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cy} + \overline{d}\,\overline{\theta_{DOT,DOT}} + L\,\theta_{DOT}\,\overline{\theta_{DOT}} \\ a_{Cz} \end{pmatrix}$$

There is something else we can say about the accelerations of points A,P,Q ... and that's their relationship with the wheel rotation accelerations $\ddot{\psi}_L$ and $\ddot{\psi}_R$:



So what we have is:

```
syms r psi_L_DOT_DOT  psi_R_DOT_DOT

EQ_aQ = r*psi_L_DOT_DOT == a_Q(1);
EQ_aP = r*psi_R_DOT_DOT == a_P(1);
```

And we can solve this set of equations. Solving for $\ddot{\psi}_R$ and $\ddot{\psi}_L$:

```
a_sol_2 = solve([EQ_aQ, EQ_aP], [psi_R_DOT_DOT, psi_L_DOT_DOT]);
```

so here's $\ddot{\psi}_L$:

```
the_psi_L_DOT_DOT = a_sol_2.psi_L_DOT_DOT
```

```
the_psi_L_DOT_DOT =
```

$$\frac{v_{Cx,DOT} + d\,\theta_{DOT}^2 - \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}}}{r}$$

so here's $\ddot{\psi}_R$:

```
the_psi_R_DOT_DOT = a_sol_2.psi_R_DOT_DOT
```

```
the_psi_R_DOT_DOT =
```

$$\frac{v_{Cx,DOT} + d\,\theta_{DOT}^2 + \overline{L}\,\overline{\theta_{DOT,DOT}} - d\,\theta_{DOT}\,\overline{\theta_{DOT}}}{r}$$

Continue with the EOMs:

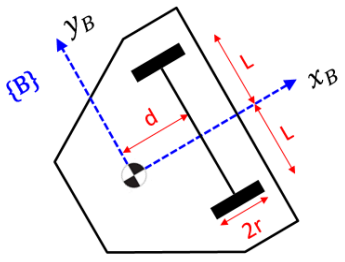
Now that we've defined some key relationships, we can revisit our equations of motion. First let's clear away some of our workspace variables ... and keep some:

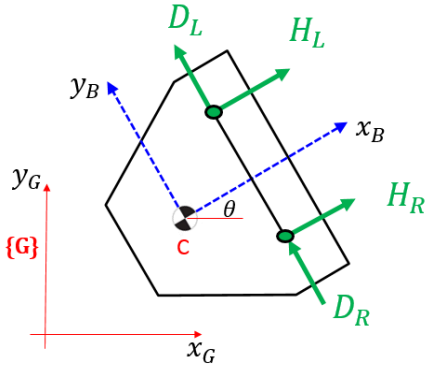
```
clearvars -except L r d a_sol_2 v_sol_2 a_Cx v_Cx theta_DOT theta_DOT_DOT
```

Define some new SYMS:

```
syms theta v_Cx v_Cx_DOT
syms theta  TaL TaR bR bL
syms I_zz  I_wR  I_wL  m m_wR  m_wL
```

Recall the Newtons equations that we derived earlier:





- $\begin{bmatrix} {}^{B}F_{X} \\ {}^{B}F_{Y} \end{bmatrix} = \begin{bmatrix} H_R + H_L \\ D_R + D_L \end{bmatrix} = m. \begin{bmatrix} {}^{B}_{G}a_{\mathrm{Cx}} \\ {}^{B}_{G}a_{\mathrm{Cy}} \end{bmatrix} = m. \begin{bmatrix} {}^{B}_{G}\dot{v}_{\mathrm{Cx}} - \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cy}} \\ {}^{B}_{G}\dot{v}_{\mathrm{Cy}} + \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cx}} \end{bmatrix}$
- $M_{\mathrm{zB}} = d.(D_L + D_R) + L.(H_R - H_L) = I_{zz}.\ddot{\theta}$

So now we can combine some of the key results and substitute them into our original equations of motion analysis. The key relations that we derived were:

- ${}^{B}_{G}v_{Cy} = -d.\dot{\theta}$ and ${}^{B}_{G}\dot{v}_{\mathrm{Cy}} = -d.\ddot{\theta}$

```
my_v_Cy       = -d*theta_DOT;
my_v_Cy_DOT   = -d*theta_DOT_DOT;
```

- $\begin{bmatrix} {}^{B}_{G}a_{\mathrm{Cx}} \\ {}^{B}_{G}a_{\mathrm{Cy}} \end{bmatrix} = \begin{bmatrix} {}^{B}_{G}\dot{v}_{\mathrm{Cx}} - \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cy}} \\ {}^{B}_{G}\dot{v}_{\mathrm{Cy}} + \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cx}} \end{bmatrix}$

```
my_a_Cx       =    v_Cx_DOT - theta_DOT*my_v_Cy;
my_a_Cy       = my_v_Cy_DOT + theta_DOT*v_Cx;
```

- $\dot{\psi}_R = \left({}^{B}_{G}v_{\mathrm{Cx}} + L.\dot{\theta}\right)\frac{1}{r}$ and $\dot{\psi}_L = \left({}^{B}_{G}v_{\mathrm{Cx}} - L.\dot{\theta}\right)\frac{1}{r}$

```
my_psi_R_DOT  = v_sol_2.psi_R_DOT;
my_psi_L_DOT  = v_sol_2.psi_L_DOT;
```

- $\ddot{\psi}_R = \left(-d.\dot{\theta}^2 + {}^{B}_{G}a_{\mathrm{Cx}} + L.\ddot{\theta}\right)\frac{1}{r}$
- $\ddot{\psi}_L = -\left(d.\dot{\theta}^2 - {}^{B}_{G}a_{\mathrm{Cx}} + L.\ddot{\theta}\right)\frac{1}{r}$

```
my_psi_R_DOT_DOT = a_sol_2.psi_R_DOT_DOT;
my_psi_L_DOT_DOT = a_sol_2.psi_L_DOT_DOT;
```

- $H_R = \left(\tau_{\mathrm{aR}} - b_R.\dot{\psi}_R - I_{\mathrm{oR}}.\ddot{\psi}_R - m_R.r^2.\ddot{\psi}_R\right)\frac{1}{r}$
- $H_L = \left(\tau_{\mathrm{aL}} - b_L.\dot{\psi}_L - I_{\mathrm{oL}}.\ddot{\psi}_L - m_L.r^2.\ddot{\psi}_L\right)\frac{1}{r}$

```
HR = (TaR -bR*my_psi_R_DOT - I_wR*my_psi_R_DOT_DOT - m_wR*(r^2)*my_psi_R_DOT_DOT)/r;
HL = (TaL -bL*my_psi_L_DOT - I_wL*my_psi_L_DOT_DOT - m_wL*(r^2)*my_psi_L_DOT_DOT)/r;
%NOTE: the resulting solutions for v_Cx_DOT, theta_DOT_DOT are greatly simplified
%      when you make the masses and inertias of the 2 wheels the same.
```

```
%HL = (TaL -bL*my_psi_L_DOT - I_wR*my_psi_L_DOT_DOT - m_wR*(r^2)*my_psi_L_DOT_DOT)/r;
```

So let's define one equation - and it will be the ${}^{B}F_{X}$ equation:

- $$\begin{bmatrix} {}^{B}F_{X} \\ {}^{B}F_{Y} \end{bmatrix} = \begin{bmatrix} H_R + H_L \\ D_R + D_L \end{bmatrix} = m. \begin{bmatrix} {}^{B}_{G}a_{\mathrm{Cx}} \\ {}^{B}_{G}a_{\mathrm{Cy}} \end{bmatrix} = m. \begin{bmatrix} {}^{B}_{G}\dot{v}_{\mathrm{Cx}} - \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cy}} \\ {}^{B}_{G}\dot{v}_{\mathrm{Cy}} + \dot{\theta}.\,{}^{B}_{G}v_{\mathrm{Cx}} \end{bmatrix}$$

```
EQ_F = (HR + HL) == (m * my_a_Cx);
```

For the 2nd equation, we'll focus on our moment equation ... where we'll substiture the $(D_L + D_R)$ term with our $(m.\,{}^{B}_{G}a_{\mathrm{Cy}})$ relationship :

- $$M_{\mathrm{zB}} = d.(D_L + D_R) + L.(H_R - H_L) = I_{zz}.\,\ddot{\theta}$$

```
DR_plus_DL = m*my_a_Cy;
EQ_M       = (d*DR_plus_DL + L*(HR-HL)) == (I_zz*theta_DOT_DOT);
```

So can we solve for $\ddot{\theta}$ and ${}^{B}_{G}\dot{v}_{\mathrm{Cx}}$:

```
S = solve([EQ_F, EQ_M], [v_Cx_DOT, theta_DOT_DOT])
```

```
Warning: Solutions are valid under the following conditions: (real(L)*((imag(m_wL)*(imag(r)^4
 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4
 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 -
 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) - (imag(m)*(imag(r)^2
 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2 - real(d)^2)
 + 2*imag(I_wL)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
 - (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2
 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
 - 4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) +
 real(L)*imag(m_wL)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
 - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) -
 real(L)*real(m_wL))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
 (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) - ((imag(d)^2 -
 real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 -
 4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
 - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
 + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
 - real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
```

```
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) -
(imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
(imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
(imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
4*abs(L)^2*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL)) - imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) - imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + (imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
+ 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz)))*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2 - real(d)^2)
+ 2*imag(I_wL)*imag(d)*real(d)) - 4*imag(L)*((imag(m_wR)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL)) + (real(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + (real(m)*(imag(r)^2 - real(r)^2)
+ 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2
- real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
+ real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) + ((imag(d)^2 -
real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
```

```
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) - 4*imag(L)*(imag(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))
+ real(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))) + real(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
4*real(L)*(imag(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) - real(L)*(imag(I_wL)*real(I_wR)
+ imag(I_wR)*real(I_wL))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4
- 6*imag(r)^2*real(r)^2) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - (2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) +
2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2 - real(r)^2)
- (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) -
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m))
- imag(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) - imag(L)*((imag(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) - (imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) - (imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
- 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))) +
(4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) + (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 -
real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
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real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) - (2*imag(d)*real(d)*(imag(m)^2
- real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) + (real(m_wR)*(imag(r)^2
- real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
((imag(d)^2 - real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2
- real(r)^2) - (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) -
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
4*abs(L)^2*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) +
imag(I_zz)*real(I_wL)) + 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) +
imag(I_zz)*real(I_wR)))*(4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) - (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
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- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) - (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 -
real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) + (2*imag(d)*real(d)*(imag(m)^2
- real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) + 4*imag(L)*(imag(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))
- real(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))) - real(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) + 4*real(L)*(imag(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))
+ real(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))) - (imag(I_zz)*imag(m) -
real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_zz)*imag(m_wL) -
real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_zz)*imag(m_wR)
- real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + ((imag(d)^2 -
real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4 + real(r)^4
- 6*imag(r)^2*real(r)^2) + (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2 -
real(r)^2) + (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m))
+ imag(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) - (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) - (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
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- 4*imag(r)^3*real(r)) - (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))
- 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))) ~= 0
| 4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2 - real(d)^2) + 2*imag(I_wL)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2
- real(d)^2) - 2*real(I_wL)*imag(d)*real(d)) + (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2
- real(d)^2) - 2*real(I_wR)*imag(d)*real(d)) + ((imag(d)^2 - real(d)^2)*(imag(m)^2 -
real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r))
+ (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ 4*abs(L)^2*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) == real(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
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- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r))
+ (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
+ 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz)) &
4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 -
real(d)^2) - 2*real(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
4*abs(L)^2*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))
+ 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR)) ==
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) + (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d))
+ (2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 -
real(d)^2))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) + real(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
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 + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
 - real(I_wL)*real(L))) + real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) + (real(m_wR)*(imag(r)^2
 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
 ((imag(d)^2 - real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4
 + real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2
 - real(r)^2) + (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) +
 (imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
 - 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
 (imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m));
(real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
 real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
 imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)))
 - (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2
 - real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
 - (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2
 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
 - 4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) +
 real(L)*imag(m_wL)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
 - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) -
 real(L)*real(m_wL))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
 (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) - ((imag(d)^2 -
 real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 -
 4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
 real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
 - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
 + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
 - real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
 (real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
 (real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L)
 - real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
 (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
 - real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
 (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
 (imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
 - real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) -
 (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
 (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
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(imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
4*abs(L)^2*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL)) - imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) - imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + (imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
+ 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz)))*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2 - real(d)^2)
+ 2*imag(I_wL)*imag(d)*real(d)) - 4*imag(L)*((imag(m_wR)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL)) + (real(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + (real(m)*(imag(r)^2 - real(r)^2)
+ 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2
- real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
+ real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) + ((imag(d)^2 -
real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) - 4*imag(L)*(imag(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))
+ real(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))) + real(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
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(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
4*real(L)*(imag(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) - real(L)*(imag(I_wL)*real(I_wR)
+ imag(I_wR)*real(I_wL))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4
- 6*imag(r)^2*real(r)^2) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - (2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) +
2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2 - real(r)^2)
- (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) -
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m))
- imag(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) - imag(L)*((imag(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) - (imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) - (imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
- 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))) +
(4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) + (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 -
real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) - (2*imag(d)*real(d)*(imag(m)^2
- real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
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- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) + (real(m_wR)*(imag(r)^2
- real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
((imag(d)^2 - real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2
- real(r)^2) - (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) -
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
4*abs(L)^2*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) +
imag(I_zz)*real(I_wL)) + 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) +
imag(I_zz)*real(I_wR)))*(4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) - (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) - (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 -
real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) + (2*imag(d)*real(d)*(imag(m)^2
- real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
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- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) + 4*imag(L)*(imag(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))
- real(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))) - real(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L))) + 4*real(L)*(imag(L)*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL))
+ real(L)*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR))) - (imag(I_zz)*imag(m) -
real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_zz)*imag(m_wL) -
real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_zz)*imag(m_wR)
- real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + ((imag(d)^2 -
real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4 + real(r)^4
- 6*imag(r)^2*real(r)^2) + (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2 -
real(r)^2) + (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m))
+ imag(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) - (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) - (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) - 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))
- 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))) == 0
& (4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2 - real(d)^2) + 2*imag(I_wL)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2
- real(d)^2) - 2*real(I_wL)*imag(d)*real(d)) + (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2
- real(d)^2) - 2*real(I_wR)*imag(d)*real(d)) + ((imag(d)^2 - real(d)^2)*(imag(m)^2 -
real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r))
+ (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
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+ 4*abs(L)^2*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) ~= real(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r))
+ (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
+ 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz)) |
4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
+ (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 -
real(d)^2) - 2*real(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
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6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
4*abs(L)^2*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))
+ 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR)) ~=
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) + (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 - real(d)^2) + 2*imag(I_wR)*imag(d)*real(d))
+ (2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 -
real(d)^2))*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) + real(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) + (real(m_wR)*(imag(r)^2
- real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
((imag(d)^2 - real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 -
real(r)^2) + (imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2)
- 2*imag(d)*real(d)*real(m)) + (imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 -
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real(d)^2) - 2*imag(d)*real(d)*real(m))) & (real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(real(I_wR)*(imag(d)^2
- real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) - (real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
- 4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) +
real(L)*imag(m_wL)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) -
real(L)*real(m_wL))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m))) - ((imag(d)^2 -
real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + imag(L)*((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
+ (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + real(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*real(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) - (imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) -
(imag(I_zz)*real(m) + real(I_zz)*imag(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
(imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
(imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(2*imag(d)*real(d)*(imag(m)^2 - real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + (imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))*(imag(r)^2
- real(r)^2) + (imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR))*(imag(r)^2 - real(r)^2) +
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) -
4*abs(L)^2*(imag(I_wL)*real(I_wR) + imag(I_wR)*real(I_wL)) - imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m)
- real(L)*real(m))) - imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
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+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + (imag(I_zz)*imag(m) - real(I_zz)*real(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))
+ 2*imag(r)*real(r)*(imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz)))*((imag(m)*(imag(r)^3
- 3*imag(r)*real(r)^2) + real(m)*(real(r)^3 - 3*imag(r)^2*real(r)))*(imag(L)*imag(TaL)
- real(L)*real(TaL)) + (imag(m)*(real(r)^3 - 3*imag(r)^2*real(r)) - real(m)*(imag(r)^3
- 3*imag(r)*real(r)^2))*(imag(L)*real(TaL) + imag(TaL)*real(L)) - (imag(m)*(imag(r)^3 -
3*imag(r)*real(r)^2) + real(m)*(real(r)^3 - 3*imag(r)^2*real(r)))*(imag(L)*imag(TaR) -
real(L)*real(TaR)) - (imag(m)*(real(r)^3 - 3*imag(r)^2*real(r)) - real(m)*(imag(r)^3 -
3*imag(r)*real(r)^2))*(imag(L)*real(TaR) + imag(TaR)*real(L)) + (imag(m_wR)*(imag(r)^3 -
3*imag(r)*real(r)^2) + real(m_wR)*(real(r)^3 - 3*imag(r)^2*real(r)))*(2*imag(L)*imag(TaL)
- 2*real(L)*real(TaL)) + (imag(m_wR)*(real(r)^3 - 3*imag(r)^2*real(r)) -
real(m_wR)*(imag(r)^3 - 3*imag(r)*real(r)^2))*(2*imag(L)*real(TaL) + 2*imag(TaL)*real(L))
- (imag(m_wL)*(imag(r)^3 - 3*imag(r)*real(r)^2) + real(m_wL)*(real(r)^3 -
3*imag(r)^2*real(r)))*(2*imag(L)*imag(TaR) - 2*real(L)*real(TaR)) - (imag(m_wL)*(real(r)^3
- 3*imag(r)^2*real(r)) - real(m_wL)*(imag(r)^3 - 3*imag(r)*real(r)^2))*(2*imag(L)*real(TaR)
+ 2*imag(TaR)*real(L)) + (imag(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))))*((imag(m)*real(m_wL) + imag(m_wL)*real(m))*(imag(L)*real(d)
+ real(L)*imag(d)) - (imag(m)*imag(m_wL) - real(m)*real(m_wL))*(imag(L)*imag(d)
- real(L)*real(d))) + (imag(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))) - real(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2)))*((imag(m)*real(m_wL) + imag(m_wL)*real(m))*(imag(L)*imag(d)
- real(L)*real(d)) + (imag(m)*imag(m_wL) - real(m)*real(m_wL))*(imag(L)*real(d)
+ real(L)*imag(d))) - (imag(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))))*((imag(m)*real(m_wR) + imag(m_wR)*real(m))*(imag(L)*real(d)
+ real(L)*imag(d)) - (imag(m)*imag(m_wR) - real(m)*real(m_wR))*(imag(L)*imag(d)
- real(L)*real(d))) - (imag(theta_DOT)*(real(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))
- real(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) +
imag(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)))*((imag(m)*real(m_wR)
+ imag(m_wR)*real(m))*(imag(L)*imag(d) - real(L)*real(d)) + (imag(m)*imag(m_wR) -
real(m)*real(m_wR))*(imag(L)*real(d) + real(L)*imag(d))) + (imag(theta_DOT)*real(v_Cx)
+ imag(v_Cx)*real(theta_DOT))*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(d) + real(I_wL)*imag(d)) - (imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(d) - real(I_wL)*real(d))) -
(imag(theta_DOT)*imag(v_Cx) - real(theta_DOT)*real(v_Cx))*((imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(d) + real(I_wL)*imag(d)) + (real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(d) - real(I_wL)*real(d))) +
(imag(theta_DOT)*real(v_Cx) + imag(v_Cx)*real(theta_DOT))*((real(m)*(imag(r)^2 - real(r)^2)
+ 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(d) + real(I_wR)*imag(d)) - (imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(d) - real(I_wR)*real(d)))
- (imag(theta_DOT)*imag(v_Cx) - real(theta_DOT)*real(v_Cx))*((imag(m)*(imag(r)^2 -
real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(d) + real(I_wR)*imag(d)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(d) -
real(I_wR)*real(d))) - ((imag(I_wL)*real(L) + imag(L)*real(I_wL))*(imag(d)*imag(m)
- real(d)*real(m)) + (imag(I_wL)*imag(L) - real(I_wL)*real(L))*(imag(d)*real(m)
+ real(d)*imag(m)))*(imag(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r)) - real(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT))) - ((imag(I_wL)*real(L) + imag(L)*real(I_wL))*(imag(d)*real(m)
+ real(d)*imag(m)) - (imag(I_wL)*imag(L) - real(I_wL)*real(L))*(imag(d)*imag(m)
- real(d)*real(m)))*(imag(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r))) + ((imag(I_wR)*real(L) + imag(L)*real(I_wR))*(imag(d)*imag(m)
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- real(d)*real(m)) + (imag(I_wR)*imag(L) - real(I_wR)*real(L))*(imag(d)*real(m)
+ real(d)*imag(m)))*(imag(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r)) - real(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT))) + ((imag(I_wR)*real(L) + imag(L)*real(I_wR))*(imag(d)*real(m)
+ real(d)*imag(m)) - (imag(I_wR)*imag(L) - real(I_wR)*real(L))*(imag(d)*imag(m)
- real(d)*real(m)))*(imag(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2)
+ 2*imag(r)*imag(theta_DOT)*real(r))) + imag(v_Cx)*((real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2))*(real(d)*(imag(m)^2 - real(m)^2) + 2*imag(d)*imag(m)*real(m))
+ (real(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*(imag(m)^2 -
real(m)^2) - 2*real(d)*imag(m)*real(m))) + real(v_Cx)*((real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2))*(imag(d)*(imag(m)^2 - real(m)^2) - 2*real(d)*imag(m)*real(m))
- (real(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(real(d)*(imag(m)^2 -
real(m)^2) + 2*imag(d)*imag(m)*real(m))) - 2*imag(theta_DOT)*((imag(I_wR)*real(L)
+ imag(L)*real(I_wR))*(imag(L)*imag(bL) + real(L)*real(bL)) + (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(imag(L)*real(bL) - real(L)*imag(bL))) - 2*imag(theta_DOT)*((imag(I_wL)*real(L)
+ imag(L)*real(I_wL))*(imag(L)*imag(bR) + real(L)*real(bR)) + (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(imag(L)*real(bR) - real(L)*imag(bR))) - 2*real(theta_DOT)*((imag(I_wR)*real(L)
+ imag(L)*real(I_wR))*(imag(L)*real(bL) - real(L)*imag(bL)) - (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(imag(L)*imag(bL) + real(L)*real(bL))) - 2*real(theta_DOT)*((imag(I_wL)*real(L)
+ imag(L)*real(I_wL))*(imag(L)*real(bR) - real(L)*imag(bR)) - (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(imag(L)*imag(bR) + real(L)*real(bR))) + (imag(I_wR)*real(L) +
imag(L)*real(I_wR))*(2*imag(TaL)*real(r) + 2*real(TaL)*imag(r)) - (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(2*imag(TaL)*imag(r) - 2*real(TaL)*real(r)) - (imag(I_wL)*real(L) +
imag(L)*real(I_wL))*(2*imag(TaR)*real(r) + 2*real(TaR)*imag(r)) + (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(2*imag(TaR)*imag(r) - 2*real(TaR)*real(r)) + imag(v_Cx)*((real(m)*(imag(r)^2 -
real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) - (imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL))) -
imag(v_Cx)*((real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) - (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR))) + 2*imag(v_Cx)*((real(m_wR)*(imag(r)^2 - real(r)^2)
+ 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL))) - 2*imag(v_Cx)*((real(m_wL)*(imag(r)^2 - real(r)^2)
+ 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR))) + real(v_Cx)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) + (real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL))) -
real(v_Cx)*((imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR))) + 2*real(v_Cx)*((imag(m_wR)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m_wR)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL))) - 2*real(v_Cx)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) + (real(m_wL)*(imag(r)^2
- real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*imag(bR) - real(L)*real(bR)))
+ ((imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bL) +
real(L)*imag(bL)) + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL)))*(imag(L)*imag(theta_DOT) - real(L)*real(theta_DOT)) + ((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bL) -
real(L)*real(bL)))*(imag(L)*real(theta_DOT) + real(L)*imag(theta_DOT)) + ((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bR) -
real(L)*real(bR)))*(imag(L)*imag(theta_DOT) - real(L)*real(theta_DOT)) + ((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bR) -
real(L)*real(bR)))*(imag(L)*real(theta_DOT) + real(L)*imag(theta_DOT)) + ((imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*imag(bL)
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- real(L)*real(bL)))*(2*imag(L)*imag(theta_DOT) - 2*real(L)*real(theta_DOT)) +
((real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*real(bL) +
real(L)*imag(bL)) - (imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL)))*(2*imag(L)*real(theta_DOT)
+ 2*real(L)*imag(theta_DOT)) + ((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR)))*(2*imag(L)*imag(theta_DOT) - 2*real(L)*real(theta_DOT)) +
((real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) - (imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(L)*imag(bR) - real(L)*real(bR)))*(2*imag(L)*real(theta_DOT) +
2*real(L)*imag(theta_DOT)) - (2*imag(bL)*real(v_Cx) + 2*real(bL)*imag(v_Cx))*(imag(I_wR)*real(L)
+ imag(L)*real(I_wR)) + (2*imag(bL)*imag(v_Cx) - 2*real(bL)*real(v_Cx))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L)) + (2*imag(bR)*real(v_Cx) + 2*real(bR)*imag(v_Cx))*(imag(I_wL)*real(L)
+ imag(L)*real(I_wL)) - (2*imag(bR)*imag(v_Cx) - 2*real(bR)*real(v_Cx))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L)) + (imag(theta_DOT)*real(v_Cx) +
imag(v_Cx)*real(theta_DOT))*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m))) + (imag(theta_DOT)*imag(v_Cx)
- real(theta_DOT)*real(v_Cx))*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m))) + (imag(theta_DOT)*real(v_Cx)
+ imag(v_Cx)*real(theta_DOT))*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m))) + (imag(theta_DOT)*imag(v_Cx)
- real(theta_DOT)*real(v_Cx))*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*real(m) +
real(d)*imag(m)) + (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m))))
== (4*imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))
- (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))) + (imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wL)*(imag(d)^2 - real(d)^2) - 2*real(I_wL)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wL)*(imag(d)^2
- real(d)^2) + 2*imag(I_wL)*imag(d)*real(d)) + (imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*(imag(d)^2 - real(d)^2) - 2*real(I_wR)*imag(d)*real(d))
- (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(real(I_wR)*(imag(d)^2 -
real(d)^2) + 2*imag(I_wR)*imag(d)*real(d)) + real(L)*((imag(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m)) + (real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m))) + real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) + real(L)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m))) - (2*imag(d)*real(d)*(imag(m)^2
- real(m)^2) + 2*imag(m)*real(m)*(imag(d)^2 - real(d)^2))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + 4*real(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m_wL) + real(L)*imag(m_wL))
+ (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(L)*imag(m_wL) - real(L)*real(m_wL))) + imag(L)*((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL))
- (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) + imag(L)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) -
(imag(m_wL)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) + 4*imag(L)*((real(m_wR)*(imag(r)^2 - real(r)^2) +
2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*imag(L)
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- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(L)
- real(I_wL)*real(L))) - real(L)*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(I_wR)*real(L) + imag(L)*real(I_wR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L))) - 4*real(L)*((imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(I_wL)*real(L) + imag(L)*real(I_wL)) + (real(m_wR)*(imag(r)^2
- real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(I_wL)*imag(L) - real(I_wL)*real(L))) +
(imag(I_zz)*imag(m) - real(I_zz)*real(m))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wL) - real(I_zz)*real(m_wL))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
(imag(I_zz)*imag(m_wR) - real(I_zz)*real(m_wR))*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
((imag(d)^2 - real(d)^2)*(imag(m)^2 - real(m)^2) - 4*imag(d)*real(d)*imag(m)*real(m))*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) - (imag(I_wL)*imag(I_zz) - real(I_wL)*real(I_zz))*(imag(r)^2
- real(r)^2) - (imag(I_wR)*imag(I_zz) - real(I_wR)*real(I_zz))*(imag(r)^2 - real(r)^2) -
(imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) -
(imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(m)*(imag(d)^2 - real(d)^2) - 2*imag(d)*real(d)*real(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(real(m)*(imag(d)^2 - real(d)^2) + 2*imag(d)*real(d)*imag(m)) +
4*abs(L)^2*(imag(I_wL)*imag(I_wR) - real(I_wL)*real(I_wR)) + imag(L)*((imag(m_wL)*(imag(r)^4
+ real(r)^4 - 6*imag(r)^2*real(r)^2) + real(m_wL)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(L)*imag(m) - real(L)*real(m)) - (real(m_wL)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m)
+ real(L)*imag(m))) + imag(L)*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
+ real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*imag(m) -
real(L)*real(m)) - (real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)
- imag(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(L)*real(m) +
real(L)*imag(m))) + (imag(I_zz)*real(m) + real(I_zz)*imag(m))*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wL) + real(I_zz)*imag(m_wL))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + (imag(I_zz)*real(m_wR) + real(I_zz)*imag(m_wR))*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + 2*imag(r)*real(r)*(imag(I_wL)*real(I_zz) + imag(I_zz)*real(I_wL))
+ 2*imag(r)*real(r)*(imag(I_wR)*real(I_zz) + imag(I_zz)*real(I_wR)))*((imag(m)*(real(r)^3
- 3*imag(r)^2*real(r)) - real(m)*(imag(r)^3 - 3*imag(r)*real(r)^2))*(imag(L)*imag(TaL)
- real(L)*real(TaL)) - (imag(m)*(imag(r)^3 - 3*imag(r)*real(r)^2) + real(m)*(real(r)^3
- 3*imag(r)^2*real(r)))*(imag(L)*real(TaL) + imag(TaL)*real(L)) + (imag(m)*(imag(r)^3 -
3*imag(r)*real(r)^2) + real(m)*(real(r)^3 - 3*imag(r)^2*real(r)))*(imag(L)*real(TaR) +
imag(TaR)*real(L)) - (imag(m)*(real(r)^3 - 3*imag(r)^2*real(r)) - real(m)*(imag(r)^3 -
3*imag(r)*real(r)^2))*(imag(L)*imag(TaR) - real(L)*real(TaR)) - (imag(m_wR)*(imag(r)^3 -
3*imag(r)*real(r)^2) + real(m_wR)*(real(r)^3 - 3*imag(r)^2*real(r)))*(2*imag(L)*real(TaL)
+ 2*imag(TaL)*real(L)) + (imag(m_wR)*(real(r)^3 - 3*imag(r)^2*real(r)) -
real(m_wR)*(imag(r)^3 - 3*imag(r)*real(r)^2))*(2*imag(L)*imag(TaL) - 2*real(L)*real(TaL))
+ (imag(m_wL)*(imag(r)^3 - 3*imag(r)*real(r)^2) + real(m_wL)*(real(r)^3 -
3*imag(r)^2*real(r)))*(2*imag(L)*real(TaR) + 2*imag(TaR)*real(L)) - (imag(m_wL)*(real(r)^3
- 3*imag(r)^2*real(r)) - real(m_wL)*(imag(r)^3 - 3*imag(r)*real(r)^2))*(2*imag(L)*imag(TaR)
- 2*real(L)*real(TaR)) + (imag(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))))*((imag(m)*real(m_wL) + imag(m_wL)*real(m))*(imag(L)*imag(d)
- real(L)*real(d)) + (imag(m)*imag(m_wL) - real(m)*real(m_wL))*(imag(L)*real(d)
+ real(L)*imag(d))) - (imag(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))) - real(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2)))*((imag(m)*real(m_wL) + imag(m_wL)*real(m))*(imag(L)*real(d)
+ real(L)*imag(d)) - (imag(m)*imag(m_wL) - real(m)*real(m_wL))*(imag(L)*imag(d)
- real(L)*real(d))) - (imag(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
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6*imag(r)^2*real(r)^2)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^4 +
real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r))))*((imag(m)*real(m_wR) + imag(m_wR)*real(m))*(imag(L)*imag(d)
- real(L)*real(d)) + (imag(m)*imag(m_wR) - real(m)*real(m_wR))*(imag(L)*real(d)
+ real(L)*imag(d))) + (imag(theta_DOT)*(real(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2) - imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))
- real(theta_DOT)*(real(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)) +
imag(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2)))*((imag(m)*real(m_wR)
+ imag(m_wR)*real(m))*(imag(L)*real(d) + real(L)*imag(d)) - (imag(m)*imag(m_wR) -
real(m)*real(m_wR))*(imag(L)*imag(d) - real(L)*real(d))) + (imag(theta_DOT)*real(v_Cx)
+ imag(v_Cx)*real(theta_DOT))*((imag(m)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m)*real(r))*(imag(I_wL)*real(d) + real(I_wL)*imag(d)) + (real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*imag(d) - real(I_wL)*real(d))) +
(imag(theta_DOT)*imag(v_Cx) - real(theta_DOT)*real(v_Cx))*((real(m)*(imag(r)^2 - real(r)^2)
+ 2*imag(m)*imag(r)*real(r))*(imag(I_wL)*real(d) + real(I_wL)*imag(d)) - (imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wL)*imag(d) - real(I_wL)*real(d))) +
(imag(theta_DOT)*real(v_Cx) + imag(v_Cx)*real(theta_DOT))*((imag(m)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m)*real(r))*(imag(I_wR)*real(d) + real(I_wR)*imag(d)) + (real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*imag(d) - real(I_wR)*real(d)))
+ (imag(theta_DOT)*imag(v_Cx) - real(theta_DOT)*real(v_Cx))*((real(m)*(imag(r)^2 -
real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(I_wR)*real(d) + real(I_wR)*imag(d)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(I_wR)*imag(d) -
real(I_wR)*real(d))) - ((imag(I_wL)*real(L) + imag(L)*real(I_wL))*(imag(d)*imag(m)
- real(d)*real(m)) + (imag(I_wL)*imag(L) - real(I_wL)*real(L))*(imag(d)*real(m)
+ real(d)*imag(m)))*(imag(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r))) + ((imag(I_wL)*real(L) + imag(L)*real(I_wL))*(imag(d)*real(m)
+ real(d)*imag(m)) - (imag(I_wL)*imag(L) - real(I_wL)*real(L))*(imag(d)*imag(m)
- real(d)*real(m)))*(imag(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r)) - real(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT))) + ((imag(I_wR)*real(L) + imag(L)*real(I_wR))*(imag(d)*imag(m)
- real(d)*real(m)) + (imag(I_wR)*imag(L) - real(I_wR)*real(L))*(imag(d)*real(m)
+ real(d)*imag(m)))*(imag(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(r)*real(theta_DOT)) + real(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r))) - ((imag(I_wR)*real(L) + imag(L)*real(I_wR))*(imag(d)*real(m)
+ real(d)*imag(m)) - (imag(I_wR)*imag(L) - real(I_wR)*real(L))*(imag(d)*imag(m)
- real(d)*real(m)))*(imag(theta_DOT)*(real(theta_DOT)*(imag(r)^2 - real(r)^2) +
2*imag(r)*imag(theta_DOT)*real(r)) - real(theta_DOT)*(imag(theta_DOT)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(r)*real(theta_DOT))) + imag(v_Cx)*((real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2))*(imag(d)*(imag(m)^2 - real(m)^2) - 2*real(d)*imag(m)*real(m))
- (real(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(real(d)*(imag(m)^2 -
real(m)^2) + 2*imag(d)*imag(m)*real(m))) - real(v_Cx)*((real(theta_DOT)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)) + imag(theta_DOT)*(imag(r)^4 + real(r)^4 -
6*imag(r)^2*real(r)^2))*(real(d)*(imag(m)^2 - real(m)^2) + 2*imag(d)*imag(m)*real(m))
+ (real(theta_DOT)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) -
imag(theta_DOT)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*(imag(m)^2 -
real(m)^2) - 2*real(d)*imag(m)*real(m))) + 2*imag(theta_DOT)*((imag(I_wR)*real(L)
+ imag(L)*real(I_wR))*(imag(L)*real(bL) - real(L)*imag(bL)) - (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(imag(L)*imag(bL) + real(L)*real(bL))) + 2*imag(theta_DOT)*((imag(I_wL)*real(L)
+ imag(L)*real(I_wL))*(imag(L)*real(bR) - real(L)*imag(bR)) - (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(imag(L)*imag(bR) + real(L)*real(bR))) - 2*real(theta_DOT)*((imag(I_wR)*real(L)
+ imag(L)*real(I_wR))*(imag(L)*imag(bL) + real(L)*real(bL)) + (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(imag(L)*real(bL) - real(L)*imag(bL))) - 2*real(theta_DOT)*((imag(I_wL)*real(L)
+ imag(L)*real(I_wL))*(imag(L)*imag(bR) + real(L)*real(bR)) + (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(imag(L)*real(bR) - real(L)*imag(bR))) + (imag(I_wR)*real(L) +
imag(L)*real(I_wR))*(2*imag(TaL)*imag(r) - 2*real(TaL)*real(r)) + (imag(I_wR)*imag(L) -
real(I_wR)*real(L))*(2*imag(TaL)*real(r) + 2*real(TaL)*imag(r)) - (imag(I_wL)*real(L) +
imag(L)*real(I_wL))*(2*imag(TaR)*imag(r) - 2*real(TaR)*real(r)) - (imag(I_wL)*imag(L) -
real(I_wL)*real(L))*(2*imag(TaR)*real(r) + 2*real(TaR)*imag(r)) + imag(v_Cx)*((imag(m)*(imag(r)^2 -
real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) + (real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL))) -
imag(v_Cx)*((imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bR)
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- real(L)*real(bR))) + 2*imag(v_Cx)*((imag(m_wR)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m_wR)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL))) - 2*imag(v_Cx)*((imag(m_wL)*(imag(r)^2 - real(r)^2)
- 2*imag(r)*real(m_wL)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR))) - real(v_Cx)*((real(m)*(imag(r)^2 - real(r)^2) +
2*imag(m)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) - (imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL))) +
real(v_Cx)*((real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) - (imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR))) - 2*real(v_Cx)*((real(m_wR)*(imag(r)^2 - real(r)^2)
+ 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) -
(imag(m_wR)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL))) + 2*real(v_Cx)*((real(m_wL)*(imag(r)^2 - real(r)^2) +
2*imag(m_wL)*imag(r)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) - (imag(m_wL)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wL)*real(r))*(imag(L)*imag(bR) - real(L)*real(bR)))
+ ((imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bL) +
real(L)*imag(bL)) + (real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL)))*(imag(L)*real(theta_DOT) + real(L)*imag(theta_DOT)) - ((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bL) -
real(L)*real(bL)))*(imag(L)*imag(theta_DOT) - real(L)*real(theta_DOT)) + ((imag(m)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) +
(real(m)*(imag(r)^2 - real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*imag(bR) -
real(L)*real(bR)))*(imag(L)*real(theta_DOT) + real(L)*imag(theta_DOT)) - ((real(m)*(imag(r)^2
- real(r)^2) + 2*imag(m)*imag(r)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) -
(imag(m)*(imag(r)^2 - real(r)^2) - 2*imag(r)*real(m)*real(r))*(imag(L)*imag(bR) -
real(L)*real(bR)))*(imag(L)*imag(theta_DOT) - real(L)*real(theta_DOT)) + ((imag(m_wR)*(imag(r)^2
- real(r)^2) - 2*imag(r)*real(m_wR)*real(r))*(imag(L)*real(bL) + real(L)*imag(bL)) +
(real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*imag(bL)
- real(L)*real(bL)))*(2*imag(L)*real(theta_DOT) + 2*real(L)*imag(theta_DOT)) -
((real(m_wR)*(imag(r)^2 - real(r)^2) + 2*imag(m_wR)*imag(r)*real(r))*(imag(L)*real(bL) +
real(L)*imag(bL)) - (imag(m_wR)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wR)*real(r))*(imag(L)*imag(bL) - real(L)*real(bL)))*(2*imag(L)*imag(theta_DOT)
- 2*real(L)*real(theta_DOT)) + ((imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(L)*real(bR) + real(L)*imag(bR)) +
(real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*imag(bR)
- real(L)*real(bR)))*(2*imag(L)*real(theta_DOT) + 2*real(L)*imag(theta_DOT)) -
((real(m_wL)*(imag(r)^2 - real(r)^2) + 2*imag(m_wL)*imag(r)*real(r))*(imag(L)*real(bR) +
real(L)*imag(bR)) - (imag(m_wL)*(imag(r)^2 - real(r)^2) -
2*imag(r)*real(m_wL)*real(r))*(imag(L)*imag(bR) - real(L)*real(bR)))*(2*imag(L)*imag(theta_DOT) -
2*real(L)*real(theta_DOT)) - (2*imag(bL)*imag(v_Cx) - 2*real(bL)*real(v_Cx))*(imag(I_wR)*real(L)
+ imag(L)*real(I_wR)) - (2*imag(bL)*real(v_Cx) + 2*real(bL)*imag(v_Cx))*(imag(I_wR)*imag(L)
- real(I_wR)*real(L)) + (2*imag(bR)*imag(v_Cx) - 2*real(bR)*real(v_Cx))*(imag(I_wL)*real(L)
+ imag(L)*real(I_wL)) + (2*imag(bR)*real(v_Cx) + 2*real(bR)*imag(v_Cx))*(imag(I_wL)*imag(L) -
real(I_wL)*real(L)) - (imag(theta_DOT)*real(v_Cx) +
imag(v_Cx)*real(theta_DOT))*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m)) +
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m))) + (imag(theta_DOT)*imag(v_Cx)
- real(theta_DOT)*real(v_Cx))*((imag(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wL)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m)) -
(real(m_wL)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wL)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m))) - (imag(theta_DOT)*real(v_Cx)
+ imag(v_Cx)*real(theta_DOT))*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m)) +
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3
- 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m))) + (imag(theta_DOT)*imag(v_Cx)
- real(theta_DOT)*real(v_Cx))*((imag(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) +
real(m_wR)*(4*imag(r)*real(r)^3 - 4*imag(r)^3*real(r)))*(imag(d)*imag(m) - real(d)*real(m)) -
(real(m_wR)*(imag(r)^4 + real(r)^4 - 6*imag(r)^2*real(r)^2) - imag(m_wR)*(4*imag(r)*real(r)^3 -
4*imag(r)^3*real(r)))*(imag(d)*real(m) + real(d)*imag(m)))). To include parameters and conditions
in the solution, specify the 'ReturnConditions' value as 'true'.
S = struct with fields:
```

```
     v_Cx_DOT: [2×1 sym]
theta_DOT_DOT: [2×1 sym]
```