x: x(t);

y: y(t);

z: z(t);

vx: diff(x , t);

vy: diff(y , t);

vz: diff(z , t);

T: m / 2 \* sqrt(vx^2 + vy^2 + vz^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2 + (z - z0)^2) - L0)^2;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dUdx: diff(U, x);

dUdy: diff(U, y);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdx;

------------------------------------------------------------------------------------------

x: x(t);

y: y(t);

vx: diff(x , t);

vy: diff(y , t);

T: m / 2 \* sqrt(vx^2 + vy^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2) - L0)^2;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dUdx: diff(U, x);

dUdy: diff(U, y);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdx;

/\*

expand(eqx);

expand(eqy);

\*/

/\*

res: desolve([eqx, eqy], [x(t), y(t)]);

\*/

-------------------------------------------------------------

assume

atvalue

**subst(a,b,c)**

Substitutes a for b in c.

---------------------------------

x: x(t);

y: y(t);

z: z(t);

vx: diff(x, t);

vy: diff(y, t);

vz: diff(z, t);

T: m / 2 \* sqrt(vx^2 + vy^2 + vz^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2 + (z - z0)^2) - L0)^2 - m \* g \* y;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

dTdvz: diff(T, vz);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

ddTdvzdt: diff(dTdvz, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dTdz: diff(T, z);

dUdx: diff(U, x);

dUdy: diff(U, y);

dUdz: diff(U, z);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdy;

eqz: ddTdvzdt = dUdz;

-------------------------------------------

x: x(t);

y: y(t);

z: z(t);

vx: diff(x, t);

vy: diff(y, t);

vz: diff(z, t);

T: m / 2 \* sqrt(vx^2 + vy^2 + vz^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2 + (z - z0)^2) - L0)^2;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

dTdvz: diff(T, vz);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

ddTdvzdt: diff(dTdvz, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dTdz: diff(T, z);

dUdx: diff(U, x);

dUdy: diff(U, y);

dUdz: diff(U, z);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdy;

eqz: ddTdvzdt = dUdz;

deqxdt: diff(eqx, t);

deqydt: diff(eqy, t);

deqzdt: diff(eqz, t);

--------------------------------------------------------------------------

x: x(t);

y: y(t);

z: z(t);

vx: diff(x, t);

vy: diff(y, t);

vz: diff(z, t);

T: m / 2 \* sqrt(vx^2 + vy^2 + vz^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2 + (z - z0)^2) - L0)^2;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

dTdvz: diff(T, vz);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

ddTdvzdt: diff(dTdvz, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dTdz: diff(T, z);

dUdx: diff(U, x);

dUdy: diff(U, y);

dUdz: diff(U, z);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdy;

eqz: ddTdvzdt = dUdz;

d4xdt4:deqxdt: diff(eqx, t, 2);

d4xdt4m: subst(l^2, (x - x0)^2 + (y - y0)^2 + (z - z0)^2, d4xdt4);

d4xdt4m2: subst(dx, (x - x0), d4xdt4m);

d4xdt4m3: subst(dy, (y - y0), d4xdt4m2);

d4xdt4m4: subst(dz, (z - z0), d4xdt4m3);

d4xdt4m5: d4xdt4m4;

d4xdt4m6:subst(vjx, (diff(x, t)), d4xdt4m5);

d4xdt4m7:subst(vjy, (diff(y, t)), d4xdt4m6);

d4xdt4m8:subst(vjz, (diff(z, t)), d4xdt4m7);

d4xdt4m9:subst(ajx, (diff(x, t, 2)), d4xdt4m8);

d4xdt4m10:subst(ajy, (diff(y, t, 2)), d4xdt4m9);

d4xdt4m11:subst(ajz, (diff(z, t, 2)), d4xdt4m10);

d4xdt4m12:subst(bvjxs, 2 \* (vjx)^2, d4xdt4m11);

d4xdt4m13:subst(bvjys, 2 \* (vjy)^2, d4xdt4m12);

d4xdt4m14:subst(bvjzs, 2 \* (vjz)^2, d4xdt4m13);

d4xdt4m15:subst(l, abs(l), d4xdt4m14);

d4xdt4m16:subst(bdxvjx, 2 \* dx \* vjx, d4xdt4m15);

d4xdt4m17:subst(bdyvjy, 2 \* dy \* vjy, d4xdt4m16);

d4xdt4m18:subst(bdzvjz, 2 \* dz \* vjz, d4xdt4m17);

d4xdt4m19:subst(bajxdx, 2 \* ajx \* dx, d4xdt4m18);

d4xdt4m20:subst(bajydy, 2 \* ajy \* dy, d4xdt4m19);

d4xdt4m21:subst(bajzdz, 2 \* ajz \* dz, d4xdt4m20);

d4xdt4m22:subst(bdmv, bdzvjz + bdyvjy + bdxvjx, d4xdt4m21);

d4xdt4m23:subst(bvmds, bvjzs + bvjys + bvjxs, d4xdt4m22);

d4xdt4m24:subst(bamd, bajzdz + bajydy + bajxdx, d4xdt4m23);

d4xdt4m25:subst(0, l - L0, d4xdt4m24);

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x: x(t);

y: y(t);

z: z(t);

vx: diff(x, t);

vy: diff(y, t);

vz: diff(z, t);

T: m / 2 \* sqrt(vx^2 + vy^2 + vz^2)^2;

U: k / 2 \* (sqrt((x - x0)^2 + (y - y0)^2 + (z - z0)^2) - L0)^2 + m \* g \* x;

L: T - U;

dTdvx: diff(T, vx);

dTdvy: diff(T, vy);

dTdvz: diff(T, vz);

ddTdvxdt: diff(dTdvx, t);

ddTdvydt: diff(dTdvy, t);

ddTdvzdt: diff(dTdvz, t);

dTdx: diff(T, x);

dTdy: diff(T, y);

dTdz: diff(T, z);

dUdx: diff(U, x);

dUdy: diff(U, y);

dUdz: diff(U, z);

eqx: ddTdvxdt = dUdx;

eqy: ddTdvydt = dUdy;

eqz: ddTdvzdt = dUdz;

d4xdt4:deqxdt: diff(eqx, t, 2);

d4xdt4m: subst(l^2, (x - x0)^2 + (y - y0)^2 + (z - z0)^2, d4xdt4);

d4xdt4m2: subst(lx, (x - x0), d4xdt4m);

d4xdt4m3: subst(ly, (y - y0), d4xdt4m2);

d4xdt4m4: subst(lz, (z - z0), d4xdt4m3);

d4xdt4m5: d4xdt4m4;

d4xdt4m6:subst(vjx, (diff(x, t)), d4xdt4m5);

d4xdt4m7:subst(vjy, (diff(y, t)), d4xdt4m6);

d4xdt4m8:subst(vjz, (diff(z, t)), d4xdt4m7);

d4xdt4m9:subst(ajx, (diff(x, t, 2)), d4xdt4m8);

d4xdt4m10:subst(ajy, (diff(y, t, 2)), d4xdt4m9);

d4xdt4m11:subst(ajz, (diff(z, t, 2)), d4xdt4m10);

d4xdt4m12:subst(bvjxs, 2 \* (vjx)^2, d4xdt4m11);

d4xdt4m13:subst(bvjys, 2 \* (vjy)^2, d4xdt4m12);

d4xdt4m14:subst(bvjzs, 2 \* (vjz)^2, d4xdt4m13);

d4xdt4m15:subst(l, abs(l), d4xdt4m14);

d4xdt4m16:subst(blxvjx, 2 \* lx \* vjx, d4xdt4m15);

d4xdt4m17:subst(blyvjy, 2 \* ly \* vjy, d4xdt4m16);

d4xdt4m18:subst(blzvjz, 2 \* lz \* vjz, d4xdt4m17);

d4xdt4m19:subst(bajxlx, 2 \* ajx \* lx, d4xdt4m18);

d4xdt4m20:subst(bajyly, 2 \* ajy \* ly, d4xdt4m19);

d4xdt4m21:subst(bajzlz, 2 \* ajz \* lz, d4xdt4m20);

d4xdt4m22:subst(blmv, blzvjz + blyvjy + blxvjx, d4xdt4m21);

d4xdt4m23:subst(bvmds, bvjzs + bvjys + bvjxs, d4xdt4m22);

d4xdt4m24:subst(baml, bajzlz + bajyly + bajxlx, d4xdt4m23);