```
(%i24) kill(all);
(%o0) done
```

```
(%i1) load("vect");
(%o1)
C:/PROGRA~2/MAXIMA~1.0-2/share/maxima/5.28.0-2/share/vector/vect.mac
```

```
(%i2) declare([r,A,B,C,rcA], nonscalar);
(%o2) done
```

1 Eqs.(25) ff.

```
(%i3) r: [x,y,z];
(%o3) [x,y,z]
```

```
(%i4) A: factor(express(A0/sqrt(2)*[1,-%i,0]*exp(%i*(Omega*t-kappa*z))))
```

$$(\%o4)\quad \left[\frac{\%e^{\%i\,\Omega\,t-\%i\,\kappa\,z}\,A0}{\sqrt{2}},-\frac{\%i\,\%e^{\%i\,\Omega\,t-\%i\,\kappa\,z}\,A0}{\sqrt{2}},0\right]$$

```
(%i5) realpart(A);
```

$$(\%o5)\quad \left[\frac{\cos(\kappa\,z-\Omega\,t)\,A0}{\sqrt{2}},-\frac{\sin(\kappa\,z-\Omega\,t)\,A0}{\sqrt{2}},0\right]$$

```
(%i6) rdA: ratsimp((r.A));
```

$$(\%o6)\quad -\frac{(\sqrt{2}\,\%i\,\%e^{\%i\,\Omega\,t}\,y-\sqrt{2}\,\%e^{\%i\,\Omega\,t}\,x)\,\%e^{-\%i\,\kappa\,z}\,A0}{2}$$

```
(%i7) rcA: ev(factor(express(r~A)),simplifyall);
```

$$(\%o7)\quad \left[\frac{\%i\,z\,\%e^{\%i\,\Omega\,t-\%i\,\kappa\,z}\,A0}{\sqrt{2}},\frac{z\,\%e^{\%i\,\Omega\,t-\%i\,\kappa\,z}\,A0}{\sqrt{2}},-\frac{(y+\%i\,x)\,\%e^{\%i\,\Omega\,t-\%i\,\kappa\,z}\,A0}{\sqrt{2}}\right]$$

```
(%i8) H22: %i*e^2/(m*r1^2)*sigma[z]*factor(rdA*rcA);
```

$$(\%o8)\quad \left[\frac{e^2\,(\%i\,y-x)\,z\,\%e^{2\,\%i\,\Omega\,t-2\,\%i\,\kappa\,z}\,\sigma_z\,A0^2}{2\,m\,r1^2},-\frac{\%i\,e^2\,(\%i\,y-x)\,z\,\%e^{2\,\%i\,\Omega\,t-2\,\%i\,\kappa\,z}\,\sigma_z\,A0^2}{2\,m\,r1^2},\frac{\%i\,e^2\,(y+\%i\,x)\,(\%i\,y-x)\,\%e^{2\,\%i\,\Omega\,t-2\,\%i\,\kappa\,z}\,\sigma_z\,A0^2}{2\,m\,r1^2}\right]$$

```
(%i9) H22a: H22.[0,0,1];
```

$$(\%o9)\quad \frac{\%i\,e^2\,(y+\%i\,x)\,(\%i\,y-x)\,\%e^{2\,\%i\,\Omega\,t-2\,\%i\,\kappa\,z}\,\sigma_z\,A0^2}{2\,m\,r1^2}$$

(%i10) H22r: gfactor(realpart(H22a));

$$(\%o10)\quad -\frac{e^2\,\sigma_z\,(2\,x\,y\,\sin(2\,(\kappa\,z-\Omega\,t))+(y^2-x^2)\cos(2\,(\kappa\,z-\Omega\,t)))\,A0^2}{2\,m\,r1^2}$$

(%i11) H22i: gfactor(imagpart(H22a));

$$(\%o11)\quad \frac{e^2\,\sigma_z\,((y^2-x^2)\sin(2\,(\kappa\,z-\Omega\,t))-2\,x\,y\,\cos(2\,(\kappa\,z-\Omega\,t)))\,A0^2}{2\,m\,r1^2}$$

2 Eqs.(30) ff.

(%i12) A1: conjugate(A);

$$(\%o12)\quad \left[\frac{\%e^{\%i\,\kappa\,z-\%i\,\Omega\,t}\,A0}{\sqrt{2}},\frac{\%i\,\%e^{\%i\,\kappa\,z-\%i\,\Omega\,t}\,A0}{\sqrt{2}},0\right]$$

(%i13) realpart(A1);

$$(\%o13)\quad \left[\frac{\cos(\kappa\,z-\Omega\,t)\,A0}{\sqrt{2}},-\frac{\sin(\kappa\,z-\Omega\,t)\,A0}{\sqrt{2}},0\right]$$

This is the conjugate term r . A*

(%i14) rdA1: ratsimp((r.A1));

$$(\%o14)\quad \frac{\%e^{-\%i\,\Omega\,t}\,(\sqrt{2}\,\%i\,y+\sqrt{2}\,x)\,\%e^{\%i\,\kappa\,z}\,A0}{2}$$

(%i15) H22: %i*e^2/(m*r1^2)*sigma[z]*factor(rdA1*rcA);

$$(\%o15)\quad \left[-\frac{e^2\,(\%i\,y+x)\,z\,\sigma_z\,A0^2}{2\,m\,r1^2},\frac{\%i\,e^2\,(\%i\,y+x)\,z\,\sigma_z\,A0^2}{2\,m\,r1^2},-\frac{\%i\,e^2\,(y+\%i\,x)\,(\%i\,y+x)\,\sigma_z\,A0^2}{2\,m\,r1^2}\right]$$

(%i21) H22a: H22.[0,0,1];

$$(\%o21)\quad -\frac{\%i\,e^2\,(y+\%i\,x)\,(\%i\,y+x)\,\sigma_z\,A0^2}{2\,m\,r1^2}$$

(%i22) gfactor(H22a);

$$(\%o22)\quad \frac{e^2\,(y-\%i\,x)\,(y+\%i\,x)\,\sigma_z\,A0^2}{2\,m\,r1^2}$$

(%i29) H22r: factor((realpart(H22a)));

$$(\%o29)\quad \frac{e^2\,(y^2+x^2)\,\sigma_z\,A0^2}{2\,m\,r1^2}$$

```
(%i30) H22i: (imagpart(H22a));
(%o30) 0
```