Figure (dualityInR3Fig1.eps) showing the R3 dual plane to a vector graphically. The scaling of the dual plane was only for illustration purposes and did not match the length of the vector.

```
In[538]:=  << peeters`


(*relative to ~/physicsplay*)
peeters`setGitDir[ "../project/figures/GAelectrodynamics" ]
```

```
Out[538]=  peeters`
```

```
Out[539]=  /Users/pjoot/project/figures/GAelectrodynamics
```

```
In[524]:=  ClearAll[a, b, x, xp, e1, e2, e3, o]


a = 3;
b = 1;
{e1, e2, e3} = IdentityMatrix[3];
o = {0, 0, 0};
x = {a, b, 0};
xp = {-b, a, 0};


ClearAll[ fs, esub, bold]
fs = Style[#, FontSize → 14] &;
bold = Style[#, Bold] &;
esub = fs[Subscript[ "e" // bold , #]] &;
(*rcaptxt = OverHat["r" ] // bold // fs;
tcaptxt = OverHat["θ" ] // bold // fs;*)


Show[{
  Graphics3D[{
    Arrow[Tube[{o, e1}]],
    Arrow[Tube[{o, e2}]],
    Arrow[Tube[{o, e3}]],
    Text[esub[1], 1.1 e1],
    Text[esub[2] , 1.1 e2],
    Text[esub[3], 1.1 e3],
    Blue,
    Arrow[Tube[{o, x}]],
    Red,
    Arrow[Tube[{o, xp}]],
    Arrow[Tube[{xp, xp + e3}]],
    Blue,
    Text[Row[{"x" // bold // fs, " = a " // fs,
        esub[1], " + b " // fs, esub[2]}], x + 0.1 (Normalize[x] - e3)],
    Black,
    Text[esub[3] // fs, xp + 1.1 e3],
```
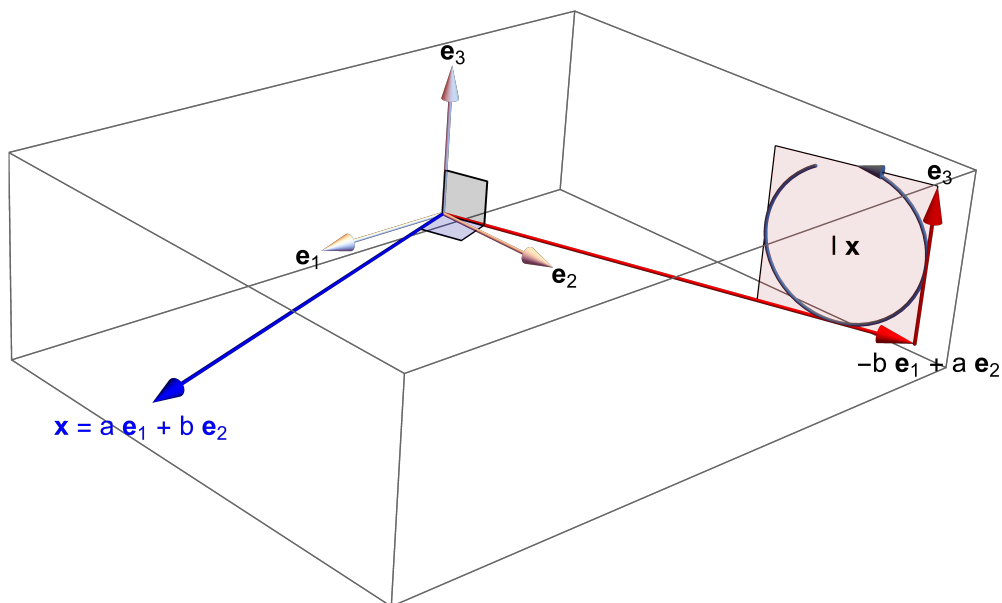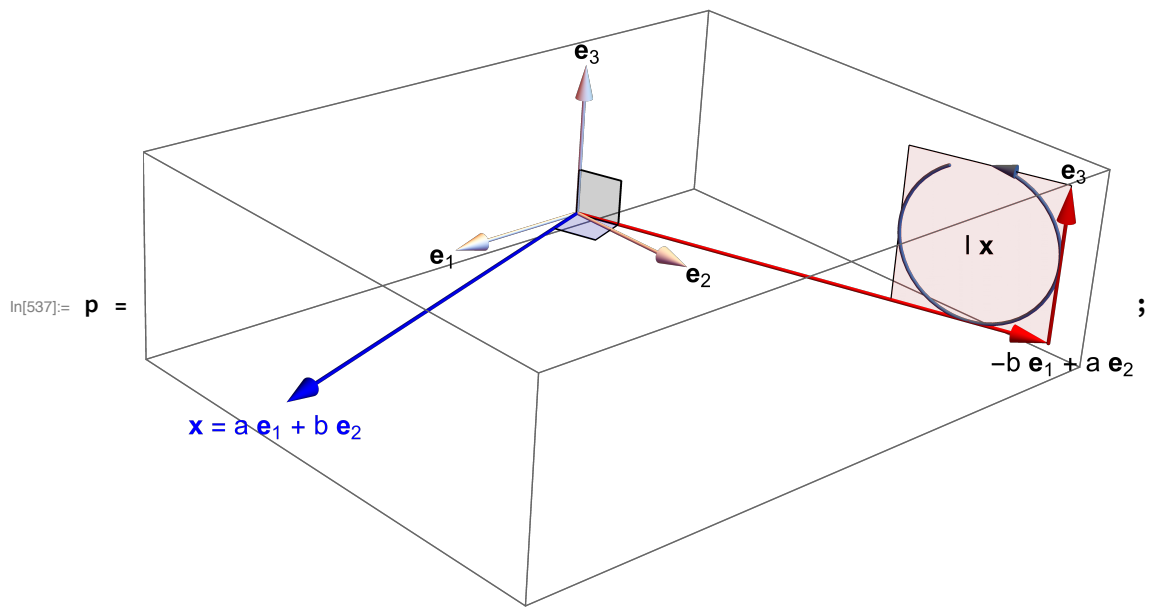
```
     Text[Row[{"-b " // fs, esub[1], " + a " // fs, esub[2]}],
      xp + 0.1 (Normalize[xp] - e3)],
     Black,
     Text[Row[{"I " // fs, "x" // bold // fs}], xp + (- Normalize[xp] + e3) / 2],
     Opacity[0.1],
     Parallelepiped[ o, 0.3 {(xp // Normalize) , e3,  x / 100}],
     Blue,
     Parallelepiped[ o, 0.3 {(x // Normalize) , (xp // Normalize),  e3 / 100}],
     Red,
     Parallelepiped[ xp, {-Normalize[xp], e3}],

    }],
   ParametricPlot3D[
     xp + (- Normalize[xp] + e3 + e3 Cos[t] + Normalize[xp] Sin[t]) / 2,
     {t, 0, 2 Pi - 0.5}] /.
    Line[x_] :> Sequence[Arrowheads[{-0.03, 0}], Arrow[Tube[{x}]]]
  }]
```

In[537]:= **p** =

(figure showing $\mathbf{x} = a\,\mathbf{e}_1 + b\,\mathbf{e}_2$ and $-b\,\mathbf{e}_1 + a\,\mathbf{e}_2$, with $I\,\mathbf{x}$) ;

In[540]:= **peeters`exportForLatex["dualityInR3Fig1", p]**

Out[540]= {dualityInR3Fig1.eps, dualityInR3Fig1pn.png}

In[536]:=