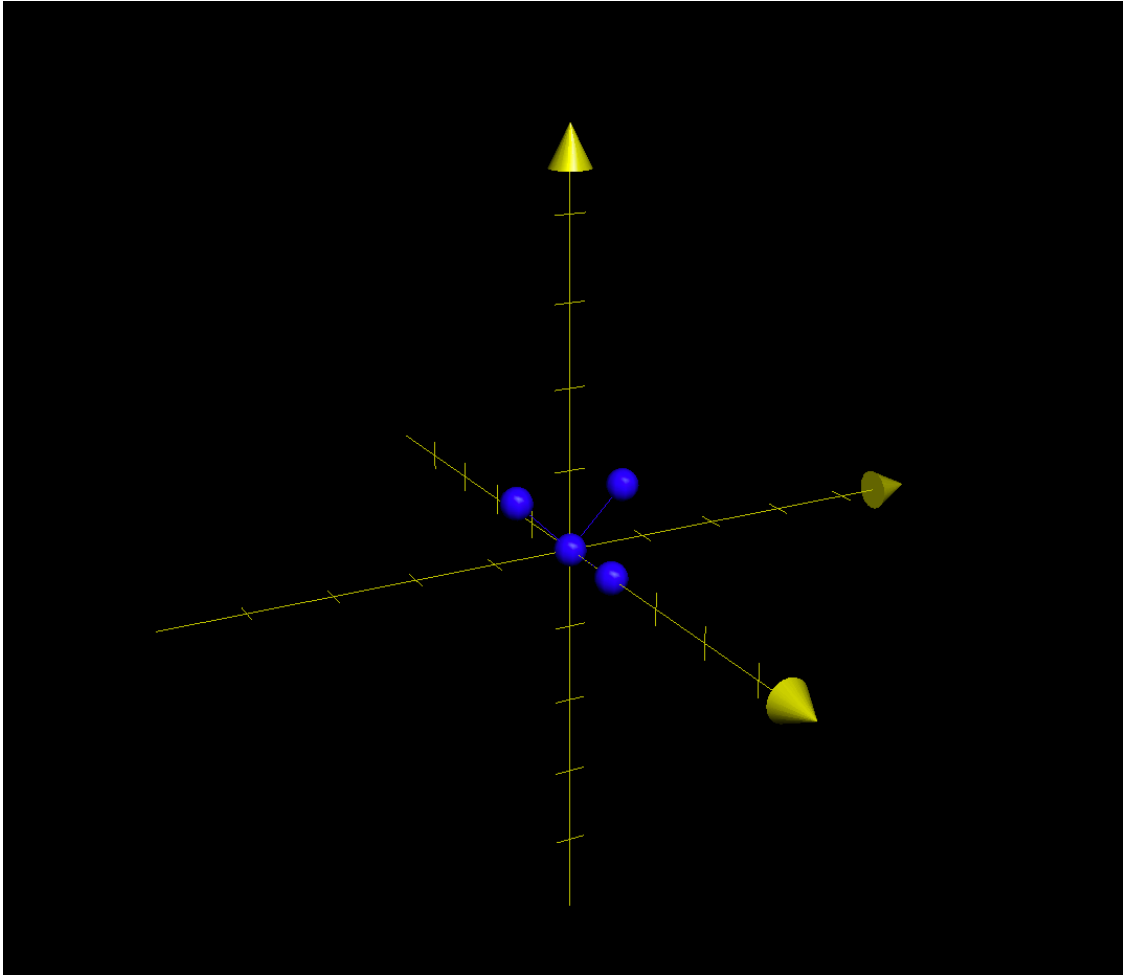
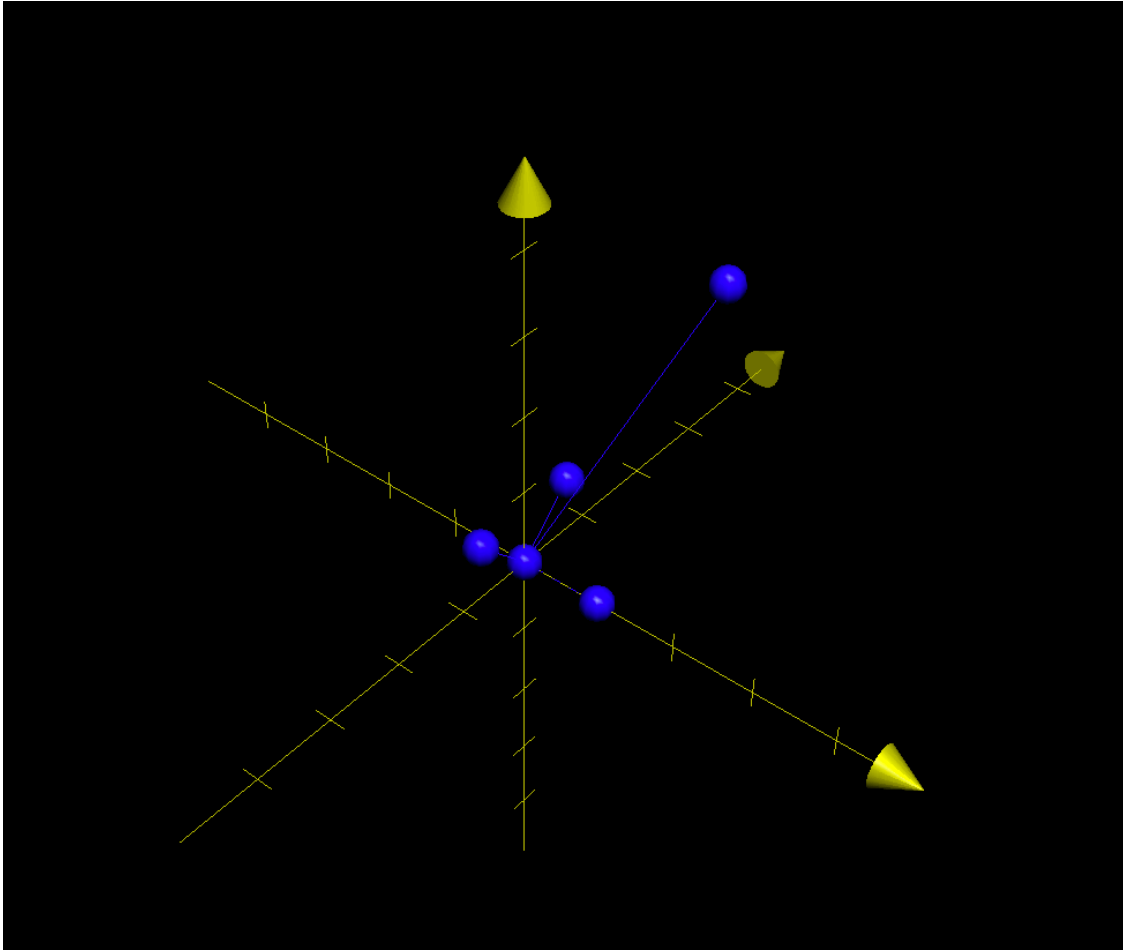


ough I spent an hour trying to get \LaTeX to position the image on the first page.

The basis:



The vector:



Change color in Grapher: Select an entry in the sidebar, then use Window > Show Inspector
The working out:

Axler 6.B ex 3

orthonormality $(1, 0, 0), (1, 1, 1), (1, 1, 2)$

$$e_1 = (1, 0, 0), \quad e_2 = \text{normalize}((1, 1, 1) - (1, 0, 0)) \\ = \text{normalize}(0, 1, 1) \\ = (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$$

$$e_3 = \text{normalize}((1, 1, 2) - (1, 0, 0) - \frac{3}{\sqrt{2}}(0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}))$$

$$= \text{normalize}((0, 1, 2) - (0, \frac{3}{2}, \frac{3}{2}))$$

$$= \text{normalize}(0, \frac{1}{2}, \frac{1}{2})$$

$$= (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$$

$$(1, 0, 0), (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}), (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$$

$$0 + \frac{1}{2} + \frac{1}{2} = 0 \quad \checkmark$$

so all pairwise inner products are zero

$$v = (1, 2, 3)$$

$$= \langle (1, 2, 3), (1, 0, 0) \rangle e_1 + \langle (1, 2, 3), (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}) \rangle e_2 + \langle (1, 2, 3), (0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}) \rangle e_3$$

$$= \boxed{1e_1 + \frac{5}{\sqrt{2}}e_2 + \frac{1}{\sqrt{2}}e_3}$$

$$= (1, 0, 0) + (0, \frac{5}{2}, \frac{5}{2}) + (0, \frac{1}{2}, \frac{1}{2})$$

$$= (1, \frac{4}{2}, \frac{6}{2}) \quad \checkmark$$