

$$\begin{aligned}
\mathbf{3.5} \quad f\left(\begin{pmatrix} x \\ y \\ z \end{pmatrix}\right) &= f(x\mathbf{e}_1 + y\mathbf{e}_2 + z\mathbf{e}_3) = x f(\mathbf{e}_1) + y f(\mathbf{e}_2) + z f(\mathbf{e}_3) \\
&= x \begin{pmatrix} 4 \\ 0 \\ -1 \\ 0 \end{pmatrix} + y \begin{pmatrix} 0 \\ 2 \\ 0 \\ 2 \end{pmatrix} + z \begin{pmatrix} 2 \\ -1 \\ 5 \\ 0 \end{pmatrix} = \begin{pmatrix} 4x + 2z \\ 2y - z \\ -x + 5z \\ 2y \end{pmatrix} \\
&= \begin{pmatrix} 4 & 0 & 2 \\ 0 & 2 & -1 \\ -1 & 0 & 5 \\ 0 & 2 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}
\end{aligned}$$