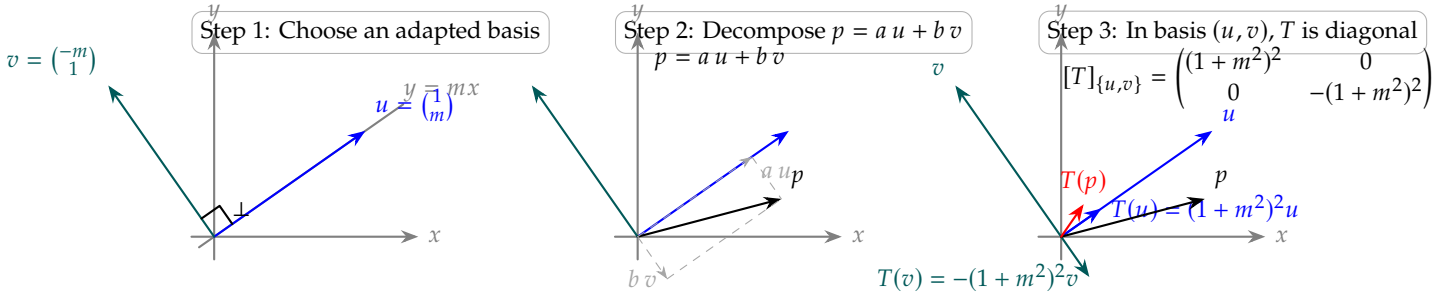
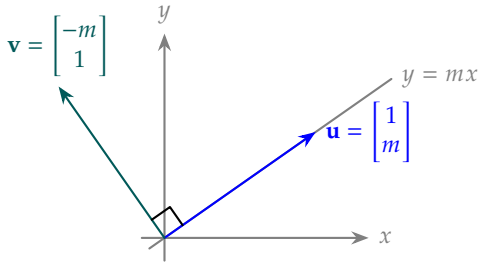
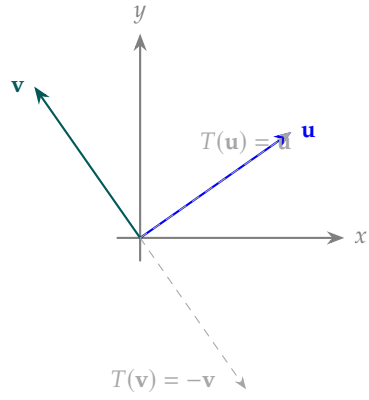

Step 1: Choose an adapted basis
$v = \begin{pmatrix} -m \\ 1 \end{pmatrix}$
$y = mx$
$u = \begin{pmatrix} 1 \\ m \end{pmatrix}$
y
x
Step 2: Decompose $p = a\,u + b\,v$
$p = a\,u + b\,v$
$a\,u$
p
$b\,v$
y
x
Step 3: In basis (u, v), T is diagonal
$[T]_{\{u,v\}} = \begin{pmatrix} (1+m^2)^2 & 0 \\ 0 & -(1+m^2)^2 \end{pmatrix}$
v
u
$T(p)$
p
$T(u) = (1+m^2)^2 u$
$T(v) = -(1+m^2)^2 v$
y
x



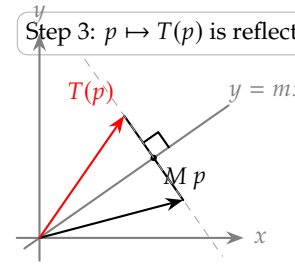
Step 1: Choose $\mathbf{u}$ (along axis) and $\mathbf{v}$ (perp)
$(\mathbf{u} \cdot \mathbf{v} = 1 \cdot (-m) + m \cdot 1 = 0)$

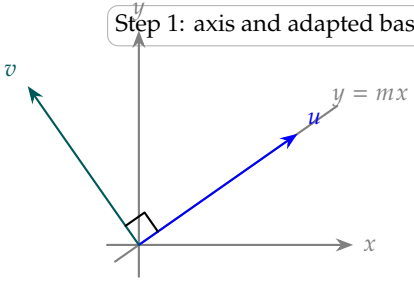


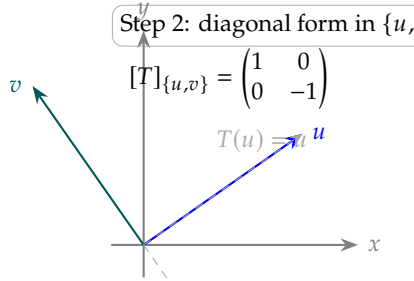
Step 2: $T(\mathbf{u}) = \mathbf{u}$, $T(\mathbf{v}) = -\mathbf{v}$

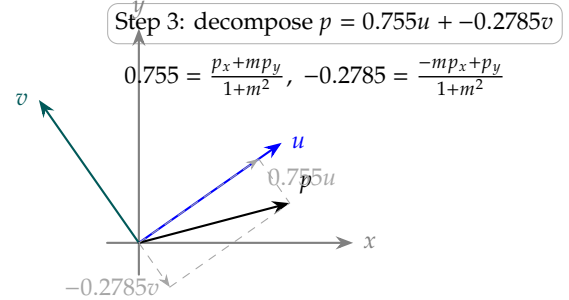
$$[T]_{\{\mathbf{u},\mathbf{v}\}} = \begin{bmatrix} T(\mathbf{u}) & T(\mathbf{v}) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

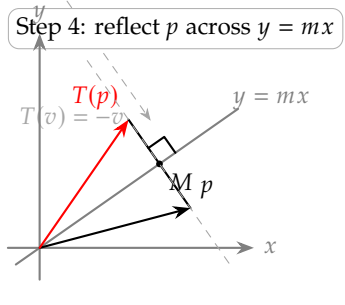
Step 3: $p \mapsto T(p)$ is reflection across $y = mx$




Step 1: axis and adapted basis
y
v
y = mx
u
x


Step 2: diagonal form in {u, v}
y
v
[T]{u,v} = (1 0; 0 −1)
T(u) = u
u
x


Step 3: decompose p = 0.755u + −0.2785v
y
0.755 = (p_x + m p_y)/(1 + m²), −0.2785 = (−m p_x + p_y)/(1 + m²)
v
u
0.755u
p
x
−0.2785v


Step 4: reflect p across y = mx
y
T(p)
T(v) = −v
y = mx
M
p
x