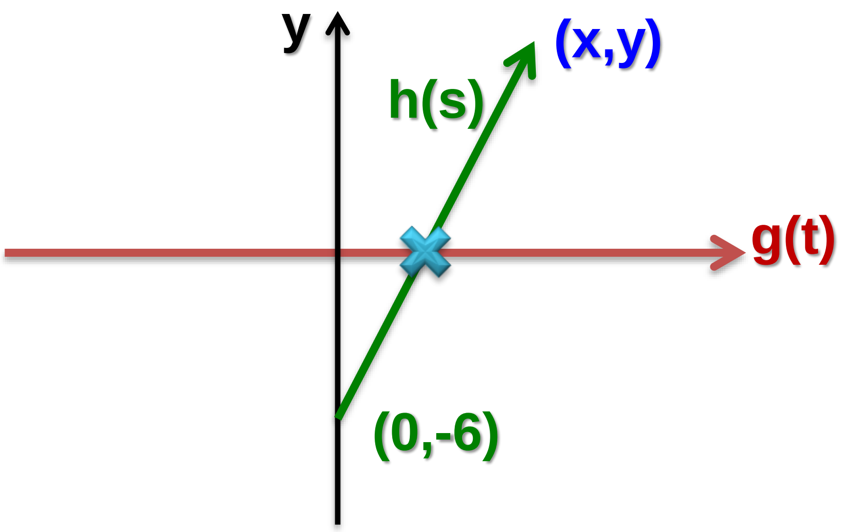
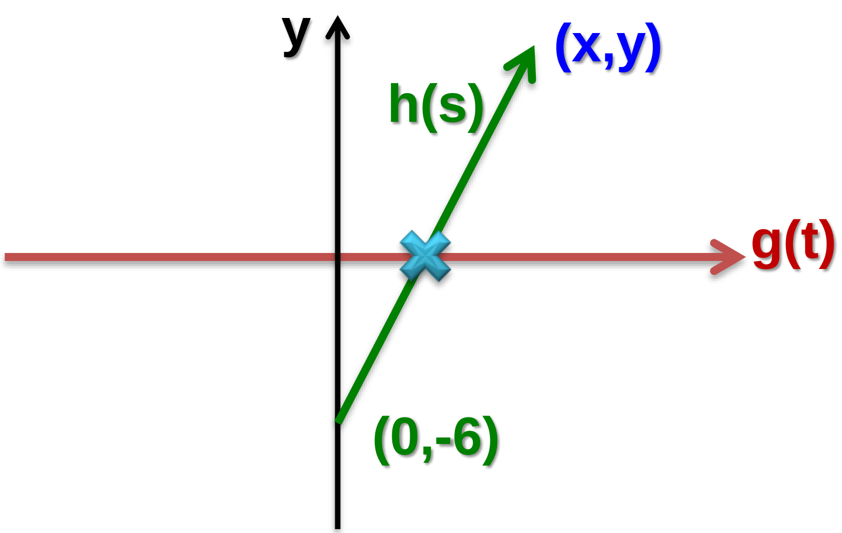
Solutions for Assignment 6

- A 3x3 matrix M to perform perspective projection in the x/y-plane onto the line y = 0.
- The center of the projection is at (0, -6)
- Solution:
  – Find **intersection** between $g(t) = (t, 0)$ and
  $$\mathrm{h}(s) = (0, -6) + s \cdot \big((x, y) - (0, -6)\big)$$



- Solution:
  - Find **intersection** between $g(t) = (t, 0)$ and
    $\mathrm{h}(s) = (0, -6) + s \cdot \big((x, y) - (0, -6)\big)$
  - $g(t) = h(s) \Rightarrow t = \frac{6x}{6+y}$
  - Thus, (x, y) is projected onto $\left(\frac{6x}{6+y}, 0\right)$
  - With homogenous division: $(x, y, 1)$ is projected onto $(6x, 0, 6 + y)$



Solutions for Assignment 6

- With homogenous division: $(x, y, 1)$ is projected onto $(6x, 0, 6 + y)$ which is equivalent to $\left(x, 0, 1 + \frac{1}{6}y\right)$
- $M \cdot \begin{pmatrix} x \\ y \\ 1 \end{pmatrix} = \begin{pmatrix} x \\ 0 \\ 1 + \frac{1}{6}y \end{pmatrix}$
- $\Rightarrow \mathrm{M} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & \frac{1}{6} & 1 \end{pmatrix}$

Solutions for Assignment 6

- A 3x3 Matrix: Rotation about 90 degrees around the axis aligned with the vector (1, 1, 0).
- Solution: Combine three basic rotations.
- $$\begin{pmatrix} \cos(-45) & -\sin(-45) & 0 \\ \sin(-45) & \cos(-45) & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} \cos(90) & 0 & \sin(90) \\ 0 & 1 & 0 \\ -\sin(90) & 0 & \cos(90) \end{pmatrix} \cdot$$
$$\begin{pmatrix} \cos(45) & -\sin(45) & 0 \\ \sin(45) & \cos(45) & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{\sqrt{2}} \\ \frac{1}{2} & \frac{1}{2} & -\frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \end{pmatrix}$$