Quiz #2 (CSE4190.410)

September 24, 2012 (Monday)

1. (10 points) Consider two parallel planes:

$$\Pi_1 : \quad ax + by + cz + d_1 = 0,$$
$$\Pi_2 : \quad ax + by + cz + d_2 = 0.$$

   (a) (4 points) What is the affine transformation from R^3 to R^1 that sends Π_1 to d_1 and Π_2 to d_2?

   (b) (2 points) What is the 1D translation that sends d_1 to 0?

   (c) (2 points) What is the 1D uniform scaling by a factor $\frac{1}{d_2 - d_1}$?

   (d) (2 point) What is the composite affine transformation of the above three?

(a) $\begin{bmatrix} -a & -b & -c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ or

$\begin{bmatrix} a & b & c & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & -d_1 \\ 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 \\ 0 & d_2 - d_1 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 \\ 0 & d_2 - d_1 \end{bmatrix} \begin{bmatrix} 1 & -d_1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} a & b & c & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

$= \begin{bmatrix} a & b & c & d_1 \\ 0 & 0 & 0 & d_1 - d_2 \end{bmatrix}$