**PMAT 319 Winter 2016.**
**Questions For Quiz 1.**

**1**. Give the definitions of a translation, a halfturn, a transformation, a collineation, a dialtation.

**2.** Prove that a translation is a transformation.

**3.** Prove that a translation is a collineation.

**4.** Prove that a halfturn is a transformation.

**5.** Prove that a halfturn is a collineation.

**6.** Let $\tau : \mathbb{R}^2 \to \mathbb{R}^2$ be the translation defined by $\tau(x, y) = (x + 1, y + 2)$. Let $P = (1, 1)$. Find the point $Q \in \mathbb{R}^2$ so that $\tau = \sigma_Q \sigma_P$.

**7.** Let $\alpha : \mathbb{R}^2 \to \mathbb{R}^2$ be the function defined by $\alpha(x, y) = (x + y, x - y)$.
   (a) Is $\alpha$ a transformation? Prove your answer.
   (b) Let $l$ be the line with equation $2x - y = 0$. Is $\alpha(l)$ a line? Prove your answer.
   (m) Let $m$ be the line with equation $y = 5$. Is $\alpha(m)$ a line? Prove your answer.

**8.** Let $A = (1, 1)$, $B = (3, 2)$ and $C = (4, 4)$.
   (a) Is $\tau_{AB}\sigma_C$ a halfturn? if so, find the point $P$ so that $\tau_{AB}\sigma_C = \sigma_P$.
   (b) Is $\sigma_C\tau_{AB}$ a halfturn? if so, find the point $Q$ so that $\sigma_C\tau_{AB} = \sigma_Q$.
   (c) Compute $\sigma_C\tau_{AB}\sigma_C(x, y)$ and $\tau_{\sigma_C(A)\sigma_C(B)}(x, y)$.

**9.** Let $A$, $B$ and $C$ be points in $\mathbb{R}^2$. Prove each of the following:
   (a) $\tau_{AB}\sigma_C\tau_{BA} = \sigma_{\tau_{AB}(C)}$.
   (b) $\sigma_B\sigma_A\sigma_B = \sigma_{\sigma_B(A)}$.
   (c) $\sigma_C\tau_{AB}\sigma_C = \tau_{\sigma_C(A)\sigma_C(B)}$.