

## MAT 310

### Chapter 5.3 Study Questions

1. Translations  $T_{\overline{PQ}}$ 
  - a. Read Definition 5.3.9. What information is required to determine a specific translation? How can we define vectors using just the SMSG axioms?
  - b. Note the function notation used in the definition. What does this mean?
  - c. What axioms are needed to ensure a point  $A' = T_{\overline{PQ}}(A)$  exists?
  - d. How do you know that such an  $A' = T_{\overline{PQ}}(A)$  is unique? Why does it need to be unique?
  - e. Read Theorem 5.3.13. How do you prove something is an isometry? What key fact from definition 5.3.9 is used in this proof and what does it allow us to conclude? How do we get from there to the final conclusion that  $T_{\overline{PQ}}$  is an isometry?
2. Rotations  $R_{p,\theta}$ 
  - a. Read Definition 5.3.10. What information is required to determine a specific rotation?
  - b. What does  $R_{p,\theta}(P) = P$  mean?
  - c. Note the function notation – what does this mean?
  - d. What axioms are needed to ensure a point  $A' = R_{p,\theta}(A)$  exists?
  - e. How do you know that such an  $A' = R_{p,\theta}(A)$  is unique? Why does it need to be unique?
  - f. Read Theorem 5.3.14. How do you prove something is an isometry? What key fact from definition 5.3.10 is used in this proof and what does it allow us to conclude? How do we get from there to the final conclusion that  $R_{p,\theta}$  is an isometry?
3. Reflections  $R_l$ 
  - a. Read Definition 5.3.11. What information is required to determine a specific reflection?
  - b. What does  $R_l(P) = P$  mean?
  - c. Note the function notation – what does this mean?
  - d. What axioms are needed to ensure a point  $A' = R_{p,\theta}(A)$  exists?
  - e. How do you know that such an  $A' = R_{p,\theta}(A)$  is unique? Why does it need to be unique?
4. Glide Reflections  $G_{\overline{PQ},l}$ 
  - a. Why is a composition of two isometries still an isometry? Write down a formal proof using function notation appropriately.