

Problem Set 3

MA 111 Spring 2009

Complete the following problems on a separate sheet of paper. This assignment is due **Wednesday, April 15**. If you refer to a source other than the instructor or class notes, you should be sure to cite it. This problem set will be much more rewarding if you do not refer to any other source.

Problem 1: Let R_3 be the reflection of the real line about the number 3. Let R_{-6} be the reflection of the real line about the number -6.

- (a) Calculate $R_3(5)$ and $R_3(-5)$. (In other words, what happens to the numbers 5 and -5 when the symmetry R_3 is applied?)
- (b) Calculate $R_{-6}(0)$ and $R_{-6}(-8)$.

In class we proved that combining two reflections in $\text{Sym}(\mathbb{R})$ produces a translation.

- (c) What translation is $S = R_3 \circ R_{-6}$? Give a formula for $S(x)$.
- (d) What translation is $T = R_{-6} \circ R_3$? Give a formula for $T(x)$.

Problem 2: How many vertices will an n -dimensional cube have? Explain (using analogies with lower dimensions) why your answer is reasonable.

Problem 3: Suppose that a 5-dimensional cube has edges of length 3. What is the volume of such a cube? Explain (using analogies with lower dimensions) why your answer is reasonable.

Problem 4: Suppose that a 5-dimensional cube has edges of length 3. What is the surface area of such a cube? Give an explanation of why your answer is reasonable. You will need to think about what the term "surface area" should mean. Be sure to justify your choice.