M$5 Homework 1

In 1 – 4, tell whether each statement is true or false. Explain your answer.

1. Every nonterminating decimal is irrational.

2. If p and q are integers, then $\frac{p}{q}$ is a rational number.

3. Every whole number is rational.

4. The smallest natural number is 0.

5. Which, if any, of the following numbers are equivalent? Explain your answer.

$$\frac{22}{7} \qquad 3.14 \qquad 3.\overline{14} \qquad \pi$$

6. Which set of numbers is *not* closed with respect to the given operation?
   (1) integers with respect to multiplication
   (2) even integers with respect to addition
   (3) integers with respect to subtraction
   (4) odd integers with respect to addition

7. Which property of real numbers is illustrated by the equation $\otimes + (\Delta + 0) = (\otimes + \Delta) + 0$?

In 8 – 11, name the property of real numbers that is illustrated by each given equation.

8. $m + 2n = 2n + m$

9. $(r + s) + t = t + (r + s)$

10. $2(x + 2y) = 2x + 4y$

11. $\sqrt{z} \cdot \frac{1}{\sqrt{z}} = 1$

12. Which of the following sets of real numbers is closed under division?
   (1) $\{1\}$ (3) $\{0\}$
   (2) {all positive integers} (4) $\{-1\}$

In 13 – 14, determine under which of the four basic arithmetic operations (addition, subtraction, multiplication, and division) each given set is closed.

13. $\left\{1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \ldots\right\}$

14. $\{$all positive multiples of 3$\}$