

**MATH 1200 (SECTION E): SAMPLE QUESTION FOR CLASS  
TEST 1**

1. Let  $A$  be the set

$$\{\alpha, \{1, \alpha\}, \{3\}, \{\{1, 3\}\}, 3\}.$$

Which of the following statements are true and which are false? Justify your answer.

- (a)  $\alpha \in A$
- (b)  $\{\alpha\} \notin A$
- (c)  $\{1, \alpha\} \subseteq A$
- (d)  $\{3, \{3\}\} \subseteq A$
- (e)  $\{1, 3\} \in A$
- (f)  $\{\{1, 3\}\} \subseteq A$
- (g)  $\{\{1, \alpha\}\} \subseteq A$
- (h)  $\emptyset \in A$
- (i)  $\emptyset \subseteq A$

2. Show that  $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$ .

3. If  $A$  implies  $B$  which of the following?

- (a) Either  $A$  is true or  $B$  is true.
- (b)  $A \Rightarrow B$
- (c)  $B \Rightarrow A$
- (d)  $\neg A \Rightarrow B$
- (e)  $\neg B \Rightarrow A$

4. Determine only which of the following is true or false.

- (a) If  $a > b$ , then  $3a$  is necessarily  $> 2b$ .
- (b) The set of all  $x$  which satisfy the inequality  $|x^2 - 5| > 4$  is all  $x$  such that  $|x| > 3$ .
- (c) IF  $x > y$ , then necessarily  $|x| > |y|$ .

5. Which of the following are True or False. Justify your answers.

- (a) If  $n^2 - 2n - 3 = 0$ , then  $n = 3$ .
- (b) For integers  $a$  and  $b$ , if  $ab$  is a square, then  $a$  and  $b$  are squares.
- (c) For integers  $a$  and  $b$ ,  $ab$  is a square if  $a$  and  $b$  are squares.

6. Disprove the following statements.

(a) If  $n$  and  $k$  are positive integers, then  $n^k - n$  is always divisible by  $k$ .

(b) Every positive integer is the sum of three squares (the squares being 0, 1, 4, 9, etc).

7. If  $n$  is an even integer, then  $n^2 + 4n + 3$  is odd.

8. Let  $n$  be an integer such that  $n^2$  is a multiple of 3. Then  $n$  is also a multiple of 3.

9. If for an integer  $n$ ,  $5n^2 + 2n + 3$  is even, then  $n$  is odd.

10. Let  $n$  be an integer. Then  $n$  is even if and only if  $n^2$  is even.