Math 164
Fall 2009
Exam - §§1.1-2.5 B

Name: (+photo id = 4 points)

Circle the letter corresponding to your answer. Circle only one answer per question. There is no partial credit on this portion of the exam. All answers must be recorded on this cover sheet. Answers to T/F and multiple choice problems not on this cover sheet will not be graded. Answer the long answer questions on the exam itself.

1. T F
2. T F
3. T F
4. T F
5. T F
6. T F
7. T F
8. T F
9. T F
10. T F
11. A B C D E
12. A B C D E
13. A B C D E
14. A B C D E
15. A B C D E
16. A B C D E
17. A B C D E
18. A B C D E
19. A B C D E
20. A B C D E
21. A B C D E
22. A B C D E
23. A B C D E

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True / False (2 points each). Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle T if the statement is always true and circle F if the statement is sometimes false.

1. T F For all sets A and B, $(A \cup B)' = A' \cap B'$

2. T F If two sets are equivalent, then they are equal.

3. T F $\emptyset \subseteq \emptyset$

4. T F If $\mathcal{U}$ is the universal set and $X \subseteq \mathcal{U}$ is any set in the universe, then $X \cup \mathcal{U} = \mathcal{U}$

5. T F The set $\{6, 8, 12\}$ is finite.

6. T F The set of real numbers has the same cardinality as the set of integers.

7. T F $\{-1, 0, 1, 2, 3\} \subset \{-1, 0, 1, 2, 3\}$

8. T F For all sets A and B, $B \subseteq (A \cup B)$

9. T F For all sets A and B, $n(A \cup B) = n(A) + n(B)$.

10. T F For all sets A and B, $A' \cup B = (A - B)'$.

Multiple Choice (4 points each). Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle the letter corresponding to the best answer.

11. Which of the following is **not** one of the four steps in Polya's problem solving process?

    A. Understand the problem

    B. Devise a plan

    C. Look back

    D. Give up

    E. None of the above

12. The sixth hexagonal number is

    A. 21

    B. 36

    C. 51

    D. 66

    E. none of the above

13. The next number in the sequence $1, 4, 11, 22, 37, 56, \ldots$ is

    A. 67

    B. 71

    C. 75

    D. 79

    E. none of the above

For the next 3 problems, consider

$$\mathcal{U} = \{a, b, c, d, e, f, g\}$$
$$A = \{a, e\}$$
$$B = \{a, b, e, f, g\}$$
$$C = \{b, f, g\}$$
$$D = \{d, e\}$$

14. Fill in the blank: $\emptyset \in$ _____

    A. A

    B. B

    C. C

    D. all of the above

    E. none of the above

15. Fill in the blank: $A \subseteq$ _____

    A. B

    B. C

    C. D

    D. all of the above

    E. none of the above

16. f is an element of which of the following?

    A. A and B

    B. B and C

    C. B and D

    D. A and D

    E. none of the above

17. The sets $\{u, v, w\}$ and $\{w, u, v\}$ are:

    A. equal

    B. equivalent

    C. both equal and equivalent

    D. infinite

    E. none of the above

18. Let A and B be sets. If $n(A) = 20$, $n(A \cap B) = 6$, and $n(A \cup B) = 30$, then $n(B) =$

    A. 6

    B. 10

    C. 14

    D. 20

    E. none of the above

For the next 5 problems, use the following situation:

It was once said that Country-Western songs emphasize three basic themes: love, prison, and trucks. A survey of a local Country-Western radio station produced the following data:

12 songs about a truck driver who is in love while in prison

13 about a prisoner in love

28 about a person in love

18 about a truck driver in love

3 about a truck driver in prison who is not in love

2 about people in prison who are not in love and do not drive trucks

8 about people who are out of prison, are not in love, and do not drive trucks

16 about truck drivers who are not in prison.

19. How many songs were surveyed?

    A. 51

    B. 43

    C. 57

    D. 70

    E. none of the above

20. How many songs were about prisoners?

    A. 30

    B. 28

    C. 31

    D. 18

    E. none of the above

21. How many songs were about people in love?

    A. 28

    B. 18

    C. 31

    D. 30

    E. none of the above

22. How many songs were about truck drivers in prison?

    A. 18

    B. 12

    C. 13

    D. 15

    E. none of the above

23. How many songs were about people not in love?

    A. 46

    B. 15

    C. 42

    D. 23

    E. none of the above

Long Answer. Answer the following questions. No work = no credit.

24. (8 points) Draw a Venn Diagram, appropriately labeling all regions, to represent the following information:

$$n(A') = 25$$
$$n(B) = 28$$
$$n(A' \cup B') = 40$$
$$n(A \cap B) = 10$$

25. (8 points) Explain why $n(\mathbb{N}) = n(\mathbb{Z})$.

26. (8 points) Find the sum

$$5 + 10 + 15 + \cdots + 1000.$$

Show all your work and explain your reasoning.