CS 173, Spring 2015
Examlet 12, Part A

NETID:

FIRST: **LAST:**

Discussion: Monday 9 10 11 12 1 2 3 4 5

(a) (9 points) Suppose that I have a set of p nodes, labelled 1 through p. How many different graphs can I make with this fixed set of nodes? (Isomorphic graphs with differently labelled nodes count as different for this problem.) Briefly justify your answer.

(b) (6 points) State the negation of the following claim, in English (not shorthand notation), moving all negations (e.g. "not") so that they are on individual predicates.

> There is a bug b, such that for every plant p, if b pollinates p and p is showy, then p is poisonous.

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(a) (9 points) Use proof by contradiction to show that there are no positive integer solutions to the equation $x^2 - y^2 = 10$.

(b) (6 points) Suppose a car dealer is planning to buy a set of Civics, Accords, and Fits (three kinds of cars). The dealer will buy ten cars in total and can buy any number of each type. How many different choices does he have? The sets are unordered, so three Civics and seven Fits is the same as seven Fits and three Civics.

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(a) (9 points) A domino has two ends, each of which may be blank or contain between one and n spots. The two ends may have the same number of spots or different numbers of spots. A double-n domino set contains exactly one of each possible dot combination, where the order of the two ends doesn't matter. For example, a double-two domino set contains $(0,0)$, $(1,0)$, $(2,0)$, $(1,1)$, $(1,2)$, and $(2,2)$. Give a general formula for the number of dominoes in a double-n set, explaining why your formula is correct.

(b) (6 points) State the negation of the following claim, in English (not shorthand notation), moving all negations (e.g. "not") so that they are on individual predicates.

> For every computer game g, if g has trendy music or g has an interesting plotline, then g is not cheap.

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(a) (9 points) Use proof by contradiction to show that, for any integer n, at least one of the three integers n, $2n + 1$, $4n + 3$ is not divisible by 7.

(b) (6 points) Chancellor Wise needs to construct a 13-person blue ribbon panel to find a new mascot, but she needs to decide how many members of the group are faculty, undergraduates, graduate students, and staff. How many ways can she choose the composition of the committee?

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(a) (9 points) Suppose $A = \{a, b, c, d\}$. In how many different ways can A be partitioned? Briefly justify or show work.

(b) (6 points) State the negation of the following claim, in English (not shorthand notation), moving all negations (e.g. "not") so that they are on individual predicates.

For any student s, if s rides a bicycle, then s wears a helmet or s has no fear of death.

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(a) (9 points) Use proof by contradiction to show that, in any group of 7 people, there is at least one person who knows an even number of people. (Assume that "knowing someone" is symmetric.)

(b) (6 points) In the polynomial $(3x - 2y)^{23}$, what is the coefficient of the term x^8y^{15}? (Please do not attempt to simplify your formula.)