CS 173, Fall 2016
Examlet 12, Part A

NETID:	

FIRST:	LAST:

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

(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, 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 there are no positive integer solutions to the equation $a^2 - 4b = 2$. (You may assume that if k is prime then k divides n if and only if k divides n^2.)

(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) Use proof by contradiction to show that $\sqrt{5} - \sqrt{3} < 1$

(b) (6 points) Use the binomial theorem to find a closed form for the summation $\sum_{k=0}^{n} (-1)^k \binom{n}{k}$. Make sure it's clear how you used the theorem.

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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, moving all negations (e.g. "not") so that they are on individual predicates.

For every relish r, if r is orange and r is not spicy, then r is pungent.

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(a) (9 points) Use proof by contradiction to show that $\sqrt{3}$ is not rational. Hints: assume that your starting fraction is in lowest terms. Also if k is prime, you can assume that k divides n if and only if k divides n^2.

(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) Use proof by contradiction to show that are no rational solutions to the equation $x^3 + x + 1 = 0$. Hint: set up x as a fraction in lowest terms, simplify the equation, and look at which combinations of terms can be even/odd.

(b) (6 points) In the polynomial $(2x - 3y)^{20}$, what is the coefficient of the term x^5y^{15}? (Please do not attempt to simplify your formula.)