Exam 3

Assignment description

Math 245 Exam 3 Spring 2020

Please read all exam directions carefully

This exam is meant to take 1-2 hours to complete. It will be assigned on the morning of Sunday, April 12, and is due Monday, April 13, at 11am. Late exams will not be accepted -- plan things out to submit your solutions well before the deadline, to account for unexpected internet outages, dead batteries, or whatnot.

Cheating Policy:

You are permitted to use the following:

1. The textbook.
2. Any notes taken from lecture, including saved whiteboards and saved chats.
3. Any materials you personally created with your own hand previous to the exam, such as solutions to homework exercises.
4. Materials that someone you personally know created with their own hand previous to the exam and shared with you, such as class notes or homework solutions.
5. Any materials found on vadim.sdsu.edu, including old exams and solutions.
6. Paper, writing tools, a calculator.
7. A computer and/or a phone, but only if used to access the permitted materials above, and to submit your answers.
8. You may email the professor, Vadim Ponomarenko, (vponomarenko@sdsu.edu) for clarification of anything unclear on this exam.

You are NOT permitted to use any of the following:

1. Assistance from any other human being, in any fashion. The sole exception is correspondence with Vadim Ponomarenko about clarification of exam questions.
2. Any websites other than Crowdmark and vadim.sdsu.edu. Posting (or emailing) an exam question is cheating, whether or not help is provided.
3. Any books, papers, or materials, other than what is permitted above.

Even after you submit your exam solutions, do not discuss the exam with anyone until after 11am on Monday, April 13.

Any violations of the above cheating policy will result in a report to SDSU's Center for Student Rights and Responsibilities, and will cause course failure or possibly worse.

If you witness a violation of the cheating policy and report it to the professor, you will be eligible for extra credit on the exam. All reports will be kept confidential.

Other Instructions:

Please write legibly, with plenty of white space. Fit your answers on blank paper, two or three answers per page, as specified in the instructions. If you wish, you may cut and rearrange pages. Be sure to write the number of each problem next to your solution. Be sure each image is in sharp focus, and oriented correctly, or points will be deducted. If necessary, take new images and reupload until you get it right. To get credit, you must also show adequate work to justify your answers. If unsure, show the work. Each problem is worth 5-10 points. You need not put your name on your answers, just on the pledge card.

Good luck!

Submit your assignment

After you have completed the assignment, please save, scan, or take photos of your work and upload your files to the questions below. Crowdmark accepts PDF, JPG, and PNG file formats.

Pledge (0 points)

Please print your name on a notecard (in the usual way, First LAST), and also sign your legal name in the middle of the card. Exams without this signed pledge will earn a score of 0.

Your signature means that you agree to the following pledge:

You swear or affirm that (1) You have carefully read the cheating policy above; and (2) You will personally follow, to the best of your ability, the cheating policy above; and (3) You will not assist anyone else in violating the cheating policy above; and (4) If you violate the cheating policy, or help someone else to do so, you hope that you get caught and punished.

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Page 1 (30 points)

Write solutions to the following three questions on one 8.5x11 page. Photograph that page, and upload it. Be sure to orient that image correctly, and that it is in sharp focus. Put your answers in consecutive order, i.e. #1 first, then #2, then #3. You need not write out the question, only the question number.

1. Let $S = \{a, b, c, d, e\}$. Find all partitions of S into exactly three parts, such that a, b are in different parts.
   Warning: missing, duplicate, extra partitions will all cost points.

2. Prove or disprove: For all sets A, B, C, D, we have $(A \Delta B) \times (C \Delta D) = (A \times C) \Delta (B \times D)$.

3. Let $S = \{1, 2, 3, 4, 5\}$. Let R be the relation on S given as $R = \{(a, b) : \exists c \in \mathbb{Z}, a \leq c^2 \leq b\}$. Draw the digraph representing R.

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Page 2 (30 points)

Write solutions to the following three questions on one 8.5x11 page. Photograph that page, and upload it. Be sure to orient that image correctly, and that it is in sharp focus. Put your answers in consecutive order, i.e. #4 first, then #5, then #6. You need not write out the question, only the question number.

4. Let S, T be sets, satisfying the property $\forall x \in T, x \notin S$. Prove that $S \cap T = \emptyset$.

5. Let S be a set, and R an antisymmetric relation on S. Prove that R^c is trichotomous.

6. Let S be a set, and R a relation on S. Let R' be the symmetric closure of R. Prove that R' is symmetric.

Page 3 (20 points)

Write solutions to the following two questions on one 8.5x11 page. Photograph that page, and upload it. Be sure to orient that image correctly, and that it is in sharp focus. Put your answers in consecutive order, i.e. #7 first, then #8. You need not write out the question, only the question number.

7. Let R, S, T be sets. Without using Theorem 8.15, prove that

$$(R \cap S) \cup (R \cap T) \subseteq R \cap (S \cup T).$$

8. Prove or disprove that $S = T$, for

$$S = \{x \in \mathbb{Z} : \exists y, z \in \mathbb{Z},\ x = 8y \wedge x = 6z\},$$

$$T = \{x \in \mathbb{Z} : \exists y, z \in \mathbb{Z},\ x = 8y \wedge x = 3z\}.$$

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Page 4 (20 points)

Write solutions to the following two questions on one 8.5x11 page. Photograph that page, and upload it. Be sure to orient that image correctly, and that it is in sharp focus. Put your answers in consecutive order, i.e. #9 first, then #10. You need not write out the question, only the question number.

9. Let A, B, C, D be sets with $|A| = |B|$ and $C \subseteq D$. Prove that $|A \times C| \leq |B \times D|$.

10. We say that set S has an *ascending chain* if there are infinitely many distinct sets $S_1, S_2, S_3, \ldots$ with $S \subseteq S_1 \subseteq S_2 \subseteq S_3 \subseteq \cdots$. We say that set S has a *descending chain* if there are infinitely many distinct sets $S_1, S_2, S_3, \ldots$ with $S \supseteq S_1 \supseteq S_2 \supseteq S_3 \supseteq \cdots$. Consider set S given by

$$S = \{x \in \mathbb{Z} : \exists y \in \mathbb{Z}, x = 2y\} = \{2x : x \in \mathbb{Z}\}.$$

Prove that S has both an ascending chain and a descending chain.

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Before you submit, please ensure that your pages are in order and rotated correctly.
You will not be able to resubmit your work after the due date has passed.

Submit for evaluation