Math 2155, Fall 2022: Homework 5

Instructions for GradeScope:

You may handwrite your answers or type them. Only type solutions if you are able to type the appropriate symbols. If **typed**, use at least a 12pt font, with **one question per page**. You can then directly submit the pdf file to GradeScope.

If **handwritten**:

- Don't erase or cross out more than a word or two.
- Only write on one side of the page. Use dark, large, neat writing.
- If you have a real scanner, great! Most people will scan their solutions using their phone. Use one of the recommended apps: For iOS, use Scannable by Evernote or Genius Scan. For Android, use Genius Scan. Do *not* just take regular photos. Read the pages at the end of this document for GradeScope's instructions.
- When scanning, have good lighting and try to avoid shadows.
- It is best to have **one question per scan**. If the solution is short, **fold the page in half** and scan just the half it is on, so there isn't so much blank space. Or, you can scan and then crop the scan. You don't need to scan parts (a), (b), etc. separately or put them on separate pages.
- It works well to scan each question separately and produce one pdf file with one question per page. Most scanning apps will automatically combine your images into one pdf file.
- You must **check the quality** of your scans afterwards, and rescan if needed.

Make sure you are going to `http://gradescope.ca` not `http://gradescope.com`. You can access it through the course OWL site.

You can **resubmit** your work any number of times until the deadline.

See the GradeScope help website for lots of information: `https://help.gradescope.com/`
Select "Student Center" and then either "Scanning Work on a Mobile Device" or "Submitting an Assignment".

Instructions for writing solutions:

- Homework is graded both on **correctness** and on **presentation/style**.
- Your proofs should be written in **complete sentences**, starting with capitals and ending with periods. They should be in **paragraph form**, similar to the proofs in the textbook. For example, you shouldn't put each sentence on a new line. Paragraphs should be used to break longer proofs into logical chunks.
- Don't use informal abbreviations such as three dots for "therefore." Logical symbols can be used when they clarify things to the reader, but English words can often be more effective.
- Include all of the steps that are needed to logically justify every claim you make. Do not include unnecessary steps. Try to be **concise and complete**.
- Do not submit any **rough work**. Do your rough work on scratch paper, and only submit a clearly and neatly written answer. Do not show a table of givens and goals. Do not use Venn diagrams.
- Do not cross out or erase more than a word or two. If you write each final solution on a new page, it's easy to start over on a fresh page when you've made a large error.
- You should do the work **on your own**. Read the course syllabus for the rules about scholastic offences, which include sharing solutions with others, uploading material to a website, viewing material of others or on a website (even if you don't use it), etc. The penalty for cheating on homework will be a grade of **0** on the homework set as well as a penalty of **negative 5%** on the overall course grade.
- We may not grade every question.

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Due **Friday, October 14 at 11:59pm**. These problems will take more time than WeBWorK problems, so plan accordingly. You can **resubmit** your work any number of times until the deadline.

Remember to read and follow the instructions, and to take into account feedback you received on HW4.

H5Q1 (6 marks): Consider the following statements:

Statement 1. For all a and $b \in \mathbb{Z}^+$, if $12 \mid 4(a-b)$, then $6 \mid (a-b)$.

Statement 2. For all $n \in \mathbb{N}$, if $3 \mid n$, then $9 \mid 2n^2 + 18$.

One of these is true and one is false. Prove the one that is correct, and give a counterexample to the one that is false.

H5Q2 (4 marks): Prove that for all $x \in \mathbb{R}$, if $x > 1$, then there exists a $y \in \mathbb{R}$ such that $x^2y - y - 1 = 0$ and $y > 0$.

H5Q3 (4 marks): Let $\mathcal{F}$ be a family of sets and let B be a set. Assume that every $A \in \mathcal{F}$ is disjoint from B. Prove that $\bigcup \mathcal{F}$ and B are disjoint.

$n = 3k$

$2n^2 + 18 = 9k$

$2n^2 + 18 = 3n$

$2n^2 - 3n + 18 = 0$

$n = 3k_1$

$2n^2 + 18 = 9k_2$

$4(a-b) = 12k$

$(a-b) = 3k$

$k = 1$

for all $n \in \mathbb{N}$. $a - b$

$x^2y - y - 1 = 0$

$(x^2 - 1)y - 1 = 0$

$y = \frac{1}{x^2 - 1}$ if $x > 1$ then $x^2 - 1 > 0$

$\forall A \in \mathcal{F}$, $A \cap B = \emptyset$.

$\forall x \in A,\ x \notin B$

$\forall x \in A,\ x \in \mathcal{F}$

$\bigcup \mathcal{F} \cap B = \emptyset$

$A \subseteq \bigcup \mathcal{F}$

$\forall x \in A\ x \in \bigcup \mathcal{F}$

Submitting PDF homework in Gradescope

For the majority of your paper-based and handwritten Gradescope assignments, you need to scan hard copies of your pages and save them as a PDF before submitting. No scanner? No problem. This guide will teach you how to scan your work on an iOS (Page 1) and Android device (Page 2) and then how to submit your scans in Gradescope from your computer, phone, or tablet (Page 3). If you are using a scanner to scan your work, skip to Page 3.

Scanning on iOS Devices

1. **DOWNLOAD:** In the App Store, download **Scannable** by Evernote (our recommended app for iOS devices). You can also download and follow a similar process with **Genius Scan** or another scanning app that produces high-quality PDFs.

2. **SCAN:** Open **Scannable**. Click the **three dots** > **Settings** > **File Type** > **PDF**. Then, click the **back arrow** > **Done**. Hold your phone above each page. The app will scan each page automatically as soon as it finds it. When you've scanned every page, click the **check mark**.

3. **REVIEW:** Review your scans. Make sure all pages are in one PDF. If your scans are blurry, use the **TIPS FOR SCANNING** on the right. Name your file by tapping the **file name** next to the PDF icon.

4. **SHARE:** Click **Send**. Then, click **Mail** to email the scans to yourself or click **Share** > **Save to Files** or **Dropbox** (or another cloud service). You may need to scroll to find all the "Save to..." options on your phone. Now, see Page 3 to learn how to log in and submit your scans.

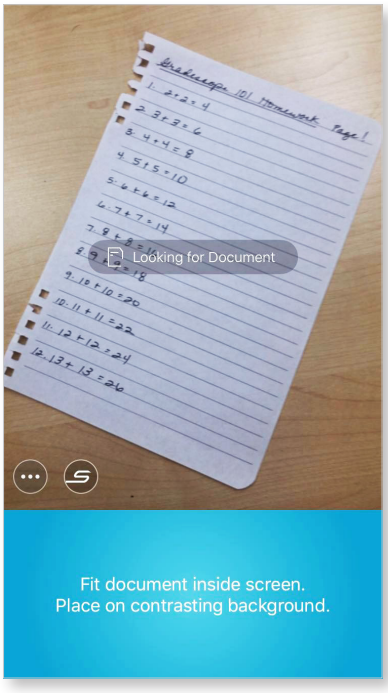
TIPS FOR SCANNING:

Use dark lettering: Use the darkest pen, pencil, or font color possible to do your work.

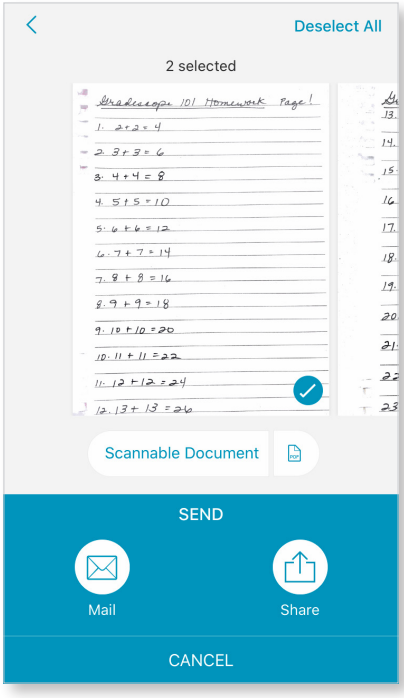
Scan on a flat surface: Scan on a dark table with high contrast to your paper.

Steady your hands: Hold your phone at a bird's eye view and scan your pages slowly with steady hands.

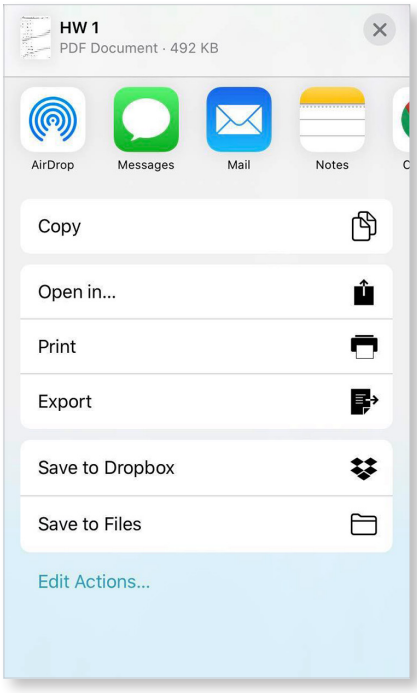
Restore photos, if needed: If your scans are blurry after clicking the check mark, select the **thumbnail** of the scan > **Slider icon** > **Restore**.



Step 2. **SCAN**



Step 3. **REVIEW**



Step 4. **SHARE**

Scanning on Android Devices

1. **DOWNLOAD:** In the Play Store, download **Genius Scan** (our recommended app for Android Devices). You can also download and follow a similar process with another scanning app that produces high-quality PDFs.

2. **SCAN:** Open **Genius Scan**. Select the **camera** icon on the main screen. If you're scanning multiple pages, tap the image icon in the top right corner of the screen to switch to **batch mode**. Hold your phone above each page and click the **spinning circle**. Repeat for each page. The number in the circle will track how many pages you've scanned to the document. Click the **check mark** when you've scanned all your pages.

3. **REVIEW:** Make sure all your pages are in one document. Name your document by tapping the name file name at the top of your screen. Review your scans for legibility. If your scans are blurry, use the **TIPS FOR SCANNING** on the right.

4. **SHARE:** Select your document, click the **Share** icon. Make sure the **Format** is set to PDF. Then, click **Mail** to send it to yourself, click **Device Memory** to save it on your phone, or click **Google Drive** or **Dropbox** (or another cloud storage option) to save it to the cloud. Now, see Page 3 to learn how to log in and submit your scans.

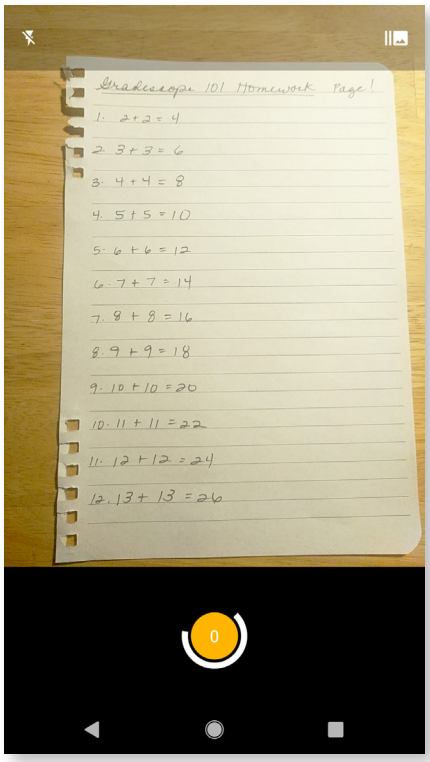
TIPS FOR SCANNING:

Use dark lettering: Use the darkest pen, pencil, or font color possible to do your work.

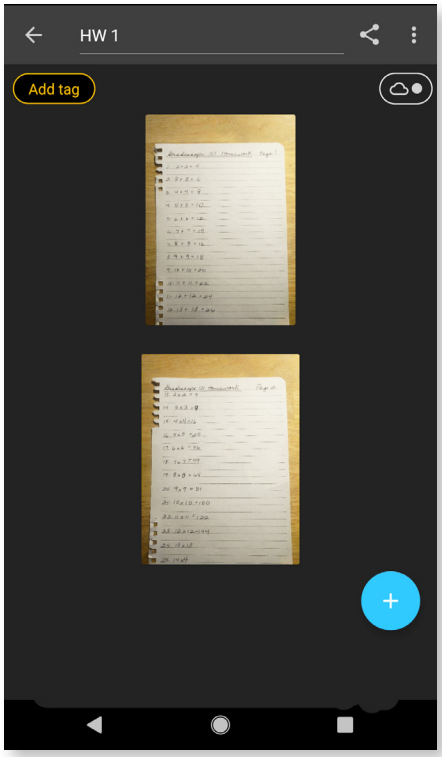
Scan on a flat surface: Scan on a dark table with high contrast to your paper.

Steady your hands: Hold your phone at a bird's eye view and scan your pages slowly with steady hands.

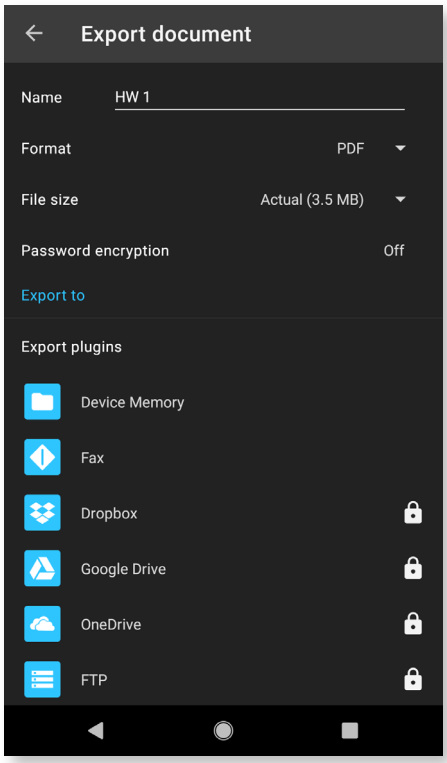
Enhance scans, if needed: If a scan is blurry, crooked, etc. once you're finished, select the thumbnail of that scan. Then, use the **Edit**, **Filters**, and **Format** button to fix them.



Step 2. **SCAN**



Step 3. **REVIEW**



Step 4. **SHARE**

Finding your assignment

1. **LOG IN:** Log in to **gradescope.com** on a computer, phone, or tablet where you can access your submission file. Be sure to log in with the email address your instructor used to add you to the course. If you're not sure which address to use, check your inboxes for an email from Gradescope about enrollment in this course, contact your instructor, or email **help@gradescope.com.**

2. **SELECT:** On your **Dashboard**, select the correct course and then assignment you'll be turning in. If you see see a submission dialog box on your screen next, move down to **Submitting a PDF**. If you see a message that your assignment will be timed, read the message carefully to see how many minutes you'll have to turn in your work. Then, click **Start Assignment** to start the timer and get to the submission dialog box.

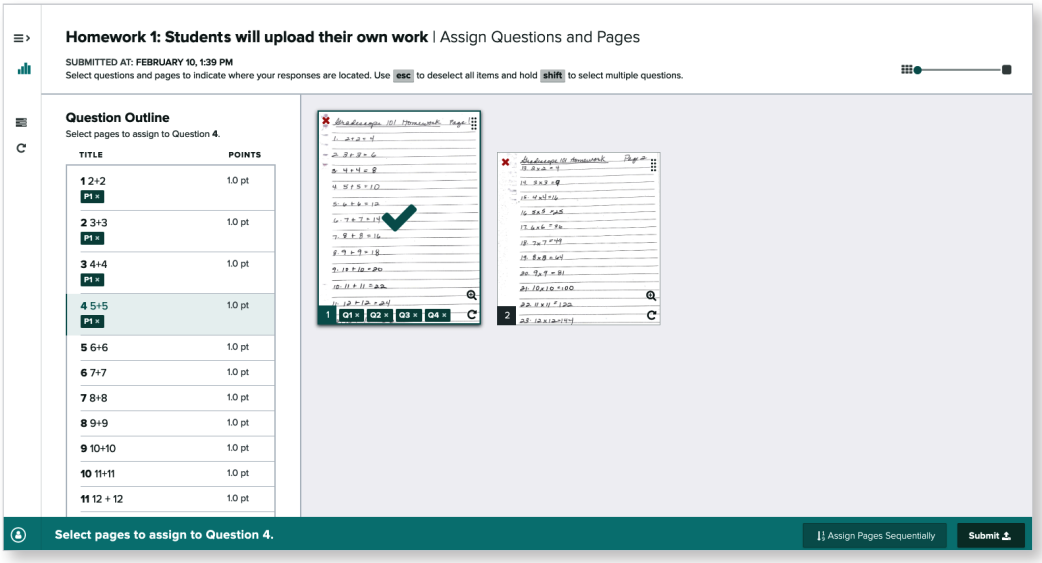
Submitting a PDF

1. **UPLOAD:** In the submission dialog box, click **Submit PDF** > **Select PDF** > locate the file > **Upload PDF.** Keep in mind that you can only submit one PDF file per assignment. Now, your instructor's assignment settings determine what you see on your screen after you upload.
   - If you're taken to a page that asks you to assign questions and pages, go to **Step 2**.
   - If a success message pops up, you're done! Sit back and relax or go to **Step 4** to resubmit your file.

2. **ASSIGN:** On your screen, you should see a list of the questions/problems in your assignment and thumbnails of your PDF page(s). For each assigned question, click the PDF page(s) that contains your answer. Use the **SHIFT** key to select multiple questions at a time and assign them to pages. If you need to, you can also assign multiple questions to the same page and multiple pages to one question.

3. **SUBMIT:** Now, click **Submit**. You will be sent to a new page to view your submission. Once you see this page and your PDF looks good, you're done! When your submission is successful, you'll see a confirmation message on your screen and you'll receive an email. If you want to resubmit, see **Step 4**.

4. **RESUBMIT (IF NEEDED):** If you need to, select the **Resubmit** button in the bottom right corner of your screen below your submission. Then, repeat the steps above as many times as needed before the assignment due date passes or the time limit runs out (if your instructor set one). Your instructor will only see your most recent submission. All your past submissions are in your **Submission History**.



Step 2. **ASSIGN**