DARTMOUTH

Mathematics Department

COMPUTING RESOURCES HANDBOOK

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Maintained by Šarūnas Burdulis
sarunas@math.dartmouth.edu

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1 Introduction

This document is intended to serve as an introduction to the computing ways of the Mathematics Department, to deal with those issues and answer those questions which would most likely come up for new (and not so new) department members.

The format of this document is very simple. Section 2, "Quick Start...", is a list of many common questions with answers, covering all sorts of topics, *e.g.* computer accounts, math major requirements, colloquia. Remaining Sections 3–9 address specific topics in more detail. **In addition**, many answers can be found in "Computing Resources" of the Mathematics Department website:

math.dartmouth.edu → News & Resources → Computing Resources:

No handbook or website could cover every possible computing problem you may encounter. In such a case the preferred way to seek solution is to ask at:

help@math.dartmouth.edu

2 Quick Start: General Questions (and Answers)

COMMUNICATIONS

- **"Where can I find the names, addresses, phone numbers, *etc.*, of department members? The main department phone and fax numbers?"**

  Log into Math Department Intranet and look for the Print Directories link. Intranet is at math.dartmouth.edu/intranet. There are links to Intranet under "Quick Links" menu as well as under small Graeco-Latin square icon at the lower right corner of the Department's webpage.

  The information in these directories is private to department members—that's why a login is necessary. See Section 6.1 for instructions on how to login.

  Note that the information in these directories is automatically extracted from your "Personal Info" record within the department database. To make corrections, *e.g.* new home address, you need to update your record. See Section 5 for instructions on how to do this.

  As for the main department phone and fax numbers, go to People→Administration (Contact Info). The numbers will be in the far right column of the "General Information" row.

- **"How do I send an email to the entire department? To just math majors?"**

  Check Department maillists on the Intranet. If you wanted to send an email to, for example, all the math majors, you would write to mathmajors@math. The complete list of aliases and their descriptions, as well as a brief editorial statement concerning email etiquette, can be found in Section 6.2.

COURSES

- **Teaching Schedules, *e.g.* "Who taught Math 13 last spring? Who will teach Math 8 in the winter?"**

  All the teaching schedules are viewable on the web: Activities → Course Information → Teaching Schedule. At the page you arrive at, select the year and term you are interested in, and how you want the resulting list ordered, *e.g.* by course number, instructor.

- **"I need to setup a course webpage. How do I do that? Where do I begin?"**

  In order to setup a course webpage, your class needs an account on `gauss`. Request it at help@math.dartmouth.edu. For example, if you are teaching Math 13 in Spring 2020, the account `m13s20` will be created, and you will get access to it. The course homepage will then be math.dartmouth.edu/~m13s20. Please read Section 3.2 for further important information.

- **"I'm teaching Math 13 for the first time. What has the syllabus for Math 13 been in recent years?"**

Activities → Course Information → Class Web Pages → By Course has links to all course webpages. Often, a syllabus, and other useful information, can be found on that course's webpage, *e.g.* Math 13 Winter 2011.

ME, MYSELF AND I

- **"How can I get a computer user account? A webpage?"**

  Request an account at help@math.dartmouth.edu. Let us know your preferred username. An account will be made on `gauss` and a randomly generated, temporary password will be emailed to you. Further important information may be found in Section 3.

  If you want a personal webpage, requesting a personal account is the way to do it. The contents of the subdirectory `public_html` in your home directory will be the location of your web files. See Section 4.1 for more information on how to get one started by (liberally) copying from someone else's.

  Note that if you do have a personal webpage, you should make sure the link (*i.e.* URL) is part of your "Personal Data" record in the department database. That way, the link will automatically be added to the *e.g.* "Who's on the faculty?" lists. See Section 5.

- **"What's on the department website that's about me? Why am I listed as a K-theorist?"**

  Listings of department personnel are available via People and its submenus, which include links to faculty and graduate students. The list typically has: name; link to personal webpage; Mathematics Subject Classification (MSC) of research (if *you* provided the classifications); office location and phone number.

  The information on these personnel pages is **automatically** retrieved from the department's database. If you want a link to your webpage to appear on this list, or make any corrections ("I'm a C^*-algebraist, not a K-theorist"), you need to modify the entries in your "Personal Data" record within the database. Section 5 explains how.

  You are **strongly encouraged**, at the least, to provide MSC categories. Whether you add anything else is up to you, but recognize that the world sees this whenever the site is viewed.

  Rest assured, not **all** this information is available to **everyone**. Your home address and phone number is viewable **only** by department members.

UNDERGRADUATE/MAJOR/GRADUATE STUDENT ISSUES

- **"I am advising first-year students. What is the policy for advanced placement credit?"**

  The answer to this question, and others like it, may be found in Undergraduate Info → For First Years.

  Other pertinent information accessible via Info for 1st Years includes AP/IB/A-Level Info, Suggested Courses and a podcast on math placement.

- **"What are the requirements for a math major? Math minor?"**

  Requirements for majoring and minoring in math are available at Undergraduate Info → Majors, Minors, respectively.

- **"What's on the graduate algebra qualifying exam?"**

  Go to Graduate → For Current Graduate Students → Certification Resources for qual syllabi. Other submenu items in Graduate Info include links to application information and a FAQ.

COMPUTING AND SOFTWARE

- **General computing help for Linux, Mac and Windows**

  Generally speaking, News & Resources → Computing Resources contains links to information regarding Linux, Mac and Windows issues and support.

- **Software resources, *e.g.* using LaTeX or "How do I log into gauss?"**

  On the Computing Resources page, will be found links to LaTeX related documents and information for secure connections.

- **Information about WeBWorK (web-based interactive homework system)**

  First of all, what is WeBWorK? To quote webwork.maa.org:

  > WeBWorK is a well-tested homework system for delivering individualized problems over the web. By providing students with immediate feedback as to the correctness of their answers, students can be encouraged to make multiple attempts until they succeed. With individualized problem sets, students can work together but will have to enter their own work to receive credit.

  Read Section 7 for a brief introduction.

- **"I would like to run Linux on my computer/laptop. Which version of Linux should I use?**

  Our favorite Linux distributions are Debian and Ubuntu, which are easy to maintain. Ensuring that the latest packages are always installed is simple and straightforward. Of course, you are free to choose whatever version of Linux you want.

- **"Can I get X Window to display on my macOS or Windows?"**

  Yes, you can. Go to Computing Resources and click on "X Window" link for your operating system.

DEPARTMENT LIFE

- **"What colloquia are scheduled this term?"**

  The answer may be easily found at Activities → Colloquia.

  Activities → Colloquia also contains links to previous colloquia announcements, as well as a links to Kemeny Lectures and Prosser Lectures. Recordings of some of the lectures are available.

- **"I'm the colloquium chair this term. How do I get the speaker's abstract and have it posted on the web? How do I email an announcement out?"**

  Colloquium proposals can be submitted using a form on the Activities → Colloquia web page. Colloquium Chair manages submissions by logging into Activities → Colloquia → Colloquium Chair Access. See Section 4.3 for more.

- **"Who was John Wesley Young?"**

  John Wesley Young was hired by the College in 1911. Learn more about him, the early history of the department and John Kemeny at News & Resources → Department History.

3 Computer Accounts

The department has a number of Linux servers. The main is **math.dartmouth.edu** or **gauss**. It is **gauss** that currently serves the department's website. All new personal and class accounts (more on this below) will be made on **gauss**. Section 8.3 lists all the servers in Math Department.

3.1 Personal Accounts

Department faculty, staff and graduate students may (and should) have a personal account on the main Math Department's server **gauss**. Some benefits of such an account are having your personal website and email address, ability to run all Math applications available on **gauss**, access to Math cloud storage, updating your own profile in Math personnel database. Request an account at help@math.dartmouth.edu. Include your desired username. An account will be created and a temporary password will be emailed to you. (Alternatively, stop by the Math Dept sysadmin's office (102E Kemeny Hall) and your account will be created at once.)

Given a temporary password, log into `gauss` using SSH from a text terminal and you will be asked to create a permanent password. You will need to come up with a password that should be **easy to remember and difficult to guess**. Some hints on how to choose a good password are:

- Let it be an acronym, *e.g.* the first letter of each word in a line from a book, show, or song (complete with punctuation and upper and lower case letters).
- Introduce some non-letters. Replace the letter "i" with the numeral "1" or an exclamation mark, or the letter "s" with a dollar sign, or the letter "a" with "@". These particular substitutions are now very common, so show your creativity here.
- Choose a password, then shift your hands one letter to the left, right, up or down when typing it.

Use your imagination! Do **not** let it simply be a name, *e.g.* a pet's name, or a word. Password crackers are very good at cracking such things.

Please also consider the following when having an account on `gauss`:

- *First*, when running a math application (which often requires significant computing resources), please "nice" your job to a lower priority, so that system processes such as backups are not delayed. All you have to do to "nice" a job is use

```
$ nice -n5 mycommand
```

instead of just

```
$ mycommand
```

- *Second*, please watch the size of your home directory. The problem is, that no matter how big hard disks become, they all suffer from the same problem of being quickly filled up with data... Please do some housekeeping regularly, for instance, during a term break. Personal home directories are a part of system backup and backups are done to at least two different media/locations. Therefore storage wasted for the obsolete data is at least tripled. The command

  ```
  $ du -cms *
  ```

  will list the size of subdirectories in MB (megabytes) starting from the current directory. It will also give a grand total in MB.

  The following one-liner will find and list 10 largest files in the current directory and all of it's subdirectories (it may take a while, depending on number of files):

  ```
  $ find -type f -exec ls -l {} \; | sort -r -n -k 5,5 | head
  ```

3.2 Class Accounts

You want the class you are teaching to have a webpage. Request your class `gauss` website account at help@math.dartmouth.edu. For example, if you are teaching Math 13 in Spring 2013, the account `m13s13` will be created, and you will be able to edit its webpages in `/home/m13s13/public_html/`. The website will be https://math.dartmouth.edu/~m13s13.

Class account names will be of the form `mXtYY`, where `X` denotes the course number, `t` — the term that particular class is taught and `YY` — two last digits of the year. Therefore the account name for the Math 13 being taught in Spring 2013 would be `m13s13`, Math 81 in Winter 2014 would be `m81w14`. `f` and `x` are for fall and summer terms respectively.

For the purpose of maintaining a permanent record in the Department, a class's webpage **must live** within that class account's `public_html` subdirectory. Creating a class website inside your personal `public_html` subdirectory is strictly verboten. If a course webpage resides in a personal `public_html` subdirectory, and that person leaves Dartmouth, their account will be removed, along with the course webpage.

4 Web Pages

4.1 Personal Webpages

To create a personal webpage, the easiest thing to do is find someone else's you like, copy the source (HTML, PHP, ...), make the appropriate changes, *e.g.* substitute your name for the victim's, and place the resulting files in your `public_html` directory. Here's how:

1. When viewing the webpage you like, use your browser to save the page as "source" (`*.html`).
2. Edit the files, tailoring them to your situation.
3. Using SCP or SFTP copy the `*.html` files to your `public_html` subdirectory.
4. View the results using your web browser and make changes as necessary.

Note that most web servers look for a page called `index.html` or `index.php` as a default file for homepage. It simply makes your URL a little nicer: you can have
math.dartmouth.edu/~username
instead of
math.dartmouth.edu/~username/myhomepage.html.

4.2 Class Webpages

Chances are good that there's a website for your class from a previous term. Check out Activities → Course Information → Class Web Pages for a list of weblinks to math courses present and past. For example, if you are teaching Math 13, visit previous Math 13 webpages, and see what they have, and how they are organized. (Note also that this is an **excellent** way of getting things like **course syllabi**.) If you like what there is already for the course form the previous term, you can use those materials as a template or starting point for your class. This will of course depend on how comfortable are you with creating/editing/scripting Web contents and how elaborate is the webpage from the previous term.

A PHP script is available to facilitate homework uploads for a given course/class. Please take a look at math.dartmouth.edu/~m76w11 for an example. The script can be customized easily. Ask help@math.dartmouth.edu.

4.3 Colloquium Webpages

Colloquium speakers should submit their proposals at Activities → Colloquia → Submit.

Colloquium Chair manages submitted proposals by logging into Activities → Colloquia → Colloquium Chair Access. There, colloquium proposals can be edited, deleted, accepted and posted to Math Dept online calendar. Once in calendar, colloquium will also be automatically listed in Upcoming Colloquia (as well as Past Colloquia) web pages. PDF announcement will also be automatically generated and available via links on Chair Access and Math calendar pages.

If Colloquium Chair has already received talk abstract via different means, there is no need to use Submit and Chair Access pages. Colloquium can simply be added as a new event directly to the Math Dept calendar, selecting "Math Colloquium" as event kind. The new event will

appear on Upcoming Colloquia web page. PDF announcement will be generated as well. If things don't seem be working as they should, email help@math.dartmouth.edu.

To announce a colloquium via email, address your message to `mathcolloq@math`. Friends and all members of the department will receive the announcement.

5 Personal Data

5.1 Background

Your "Personal Data" record in the department database consists of such items as your name, office and phone number. You, personally, may also include the **URL** of a **personal webpage**, email address, home address and phone number, and Mathematics Subject Classification (MSC) terms for your research interests.

Some of the information in your personal record is private, *e.g.* the official date you joined the department. Other information, by default, is accessible only to members of the department, *e.g.* your home address and phone number. And some is available to everyone via the web, *e.g.* your office location, research fields of interest.

You should **always** endeavor to keep your information as up-to-date and complete as possible, not only for the purposes of maintaining an accurate record, but also for the department website. A number of the Department webpages are generated dynamically. The information displayed is automatically extracted from the database.

For example, when a website visitor selects People → Faculty..., to see who the permanent members of the department are, what actually happens first, behind the scenes, is that the department database is queried, "Who are the permanent members of the department?" The database responds, "These people are." It is this response which the website visitor sees.

Changes you make to your "Personal Data" are **automatically reflected in the department website**. Furthermore, regarding the Research Interests, you are **strongly encouraged**, at the least, to provide MSC categories. Whether you add anything else is up to you, but recognize that the world sees this whenever the site is viewed.

5.2 How to Update: An Example

As an example of how to update your "Personal Data," suppose you want to add or change your research interests as they are displayed on Math Dept. personnel web pages.

1. Go to Math Dept. Intranet (log in with Math username and password).
2. Click on Update Personal Data, authenticate with NetID.
3. After authentication, you will see your own record as it is contained within the database.
4. Scroll down the page. MSC categories are entered in the fields labeled **person_msc_1** (primary research interest), **person_msc_2**, and **person_msc_3** (secondary interests). Use the drop-down menu (*i.e.* click on the little arrow that's on the right of the **msc** field), to select the correct MSC category.
5. In the **person_research** field, name your other research interests, in case they are not among predefined categories in the three fields above.
6. Type/paste in your short biography in **person_bio** field.
7. SUGGESTION: Have two browser windows/tabs open. View the People→... page in one, and log into Update Personal Data with the other. Then, as you "update" your edits, reload the "People" page to see how they look.

6 Phone/Address Directories and Email Lists

Links to department phone directories and mailing list names may be found on the Math Department Intranet (math.dartmouth.edu/intranet).

6.1 Directories

While on Intranet, click Print Directories. You will also have to authenticate with your NetID and password. Select which directory you would like, either "Faculty and Staff" or "Graduate Students." You will be able to view the desired directory in a number of formats and print it out, if needed.

6.2 Mailing Lists

For your convenience, we list some the mailing list names below. The most recent, accurate info is however on the Intranet, under Department Maillists. The *contents* of each list, *i.e.* names of people, are viewable by following the links on the web page. All maillists are invoked by *maillist_name*`@math.dartmouth.edu`, *e.g.* `mathall@math.dartmouth.edu`. Some restrictions to keep in mind:

- Math maillists will only accept messages from `...@math.dartmouth.edu` and `...@dartmouth.edu` senders.
- Maillist addresses can not be used as BCC.

Now, before we get to the maillist names, we feel obligated to bring up the matter of **email etiquette**. Since no one likes to receive email not meant for them, please use the **minimum** list name that covers your intended audience. That is, if you want to send an email to just the graduate students, address your message to `mathgrads@`... and **not** to `mathall@`... If your message is of interest only to full professors (*e.g.* it might not be appropriate for everyone), then email `math_full_profs@`... and **not** `mathfaculty@`... Wide-reaching addresses like `mathall@`... and `mathcsall@`... should be used **sparingly**. Granted, this is all common sense, but we still wanted to mention it just the same.

List names	Individual lists included in this combination
`mathall`	`math_faculty`, `math_retired`, `math_grads`, `math_staff`, `math_MATC`, `math_temporary`
`math_faculty`	`math_full_profs`, `math_assoc_profs`, `math_asst_profs`, `math_jwy_iacm`, `math_assoc_no_tenure`
`mathfaculty`	an alias for `math_faculty`
`mathgrads`	an alias for `math_grads`
`mathstaff`	an alias for `math_staff`
`mathmajors`	an alias for `math_majors`
`mathcolloq`	`mathcsall` and more

7 WeBWorK

What is WeBWorK? To quote webwork.maa.org:

> *WeBWorK is an open-source online homework system for math and sciences courses. WeBWorK is supported by the MAA and the NSF and comes with a National Problem Library (NPL) of over 20,000 homework problems. Problems in the NPL target most lower division undergraduate math courses and some advanced courses. Supported courses include college algebra, discrete mathematics, probability and statistics, single and multivariable calculus, differential equations, linear algebra and complex analysis.*

To see an example of a working WeBWorK course please go to webwork.dartmouth.edu and choose any of the courses allowing guest login. Documentation concerning how to use WeBWorK may be found at News & Resources → Computing Resources → WeBWorK Resources. Note that, while WeBWorK is useful, it does take some time and effort to setup and maintain. The perk is that not only is it a pedagogically more effective means of dealing with homework, but you also never have to deal with graders: finding them, making sure they turn papers back on time, inconsistencies between graders, and so on. Most people can get a gentle introduction to WeBWorK by teaching a multisection course with someone who has already been through the process. WeBWorK has been successfully used in a number of classes here, typically sections of Calculus.

As always, ask help@math.dartmouth.edu, if you would like a WeBWorK course created for your class or if you need help with WeBWorK itself.

8 Computing Resources

8.1 Department Computing Resources Online

The key link is math.dartmouth.edu → News & Resources → Computing Resources. For Linux, macOS and Windows this page has many of the links you need.

8.2 Networking in Kemeny Hall

8.2.1 Wireless

Wi-Fi networks in Kemeny Hall are the same as anywhere else on campus: Eduroam and Dartmouth Public. Eduroam is the main Wi-Fi network. When connecting, authenticate as *netid*@dartmouth.edu. For current and device-specific instructions lookup 'eduroam' on dartmouth.edu — you should get links to appropriate ITC help pages.

Dartmouth Public is external to the campus network, does not require authentication and is only meant for guest or temporary usage.

8.2.2 Wired

Ethernet ports labeled in **blue** should be active. There is also one additional ethernet port on the back of your office telephone. Computers attached to these ports will get an IP address assigned automatically. The address will be in the range of 129.170.28.1–255 and will change from time to time. **Please note that this is a public address range, which means that your computer is accessible from anywhere on the Internet, directly**. Please make sure to enable firewall and that software updates are applied frequently. Do not enable any unnecessary services. Please ask if not sure. While on campus network, your computer will be "seen" as *computername*.kiewit.dartmouth.edu.

If needed, a static IP address can be reserved. An Internet DNS entry will be made and your computer will be accessible as *computername*.dartmouth.edu from **anywhere** on the Internet.

Alternatively, it can be requested that a given ethernet port in your office is configured to be on a private network (10.32.28.1–255). Your computer will not be accessible directly from the public Internet, only from campus network. Both automatic/dynamic and static IP address assignments are possible.

8.3 Servers

Math Department's servers were running Ubuntu Linux, usually its current Long-term Support (LTS) version.

`gauss` is a 12-core 3.4 GHz, 96 GiB RAM machine. This is the main server, which hosts department's website, databases, personal and course webpages, print service, Math VPN gateway and also handles email for math.dartmouth.edu. There are hundreds of utilities and software tools installed. We have TEX/$\mathcal{AMS}$-LATEX, emacs, idraw, Xfig, Gimp, Inkscape, LibreOffice, Perl, GCC, GFortran, Java *etc. etc.* Mathematical applications available are GAP, GP/PARI, Macaulay, Magma, Maple, Mathematica, MATLAB, Octave, R, Sagemath, Jupyterlab. Please ask help@math.dartmouth.edu, if you need something else. As explained in Section 3.1, faculty, staff and graduate students may have their personal accounts on `gauss`.

`doob` is a **96-core** 3.6 GHz AMD Epyc system with **1.48 TiB** of RAM and two Nvidia GPUs: A10 and A100 80GiB. It has the same mathematics applications installed as `gauss`.

`euclid` is a dedicated Jupyterlab server for logins with NetID. Accounts are created automatically on first login. Might be useful for the class you are teaching.

`webwork` is a dedicated server for WeBWorK, an online homework system (see Section 7 for more on WeBWorK).

`euler` and `backus` provide storage volumes for backups and archive snapshots (`backus` is off-site). `euler` is also a VM host.

`math-N` hosts form Math storage cluster, currently using Ceph.

8.4 Jupyterlab — Jupyter Notebook Server

Head to doob.dartmouth.edu for Department's own Jupyter service. Log in with your doob account. Jupyter evolved from IPython notebook and now supports multiple programming languages. There are Python, R and Sagemath kernels available. If your preferred language is not yet available, we might be able to add it.

8.5 Math cloud — Nextcloud

Mathematics Department's "cloud" storage is at math.dartmouth.edu/nextcloud. Log in with your Math account. Use it similarly to Dropbox/Google Drive/etc. to share files between your own devices, with colleagues at the Math Department or anyone with an email address. Nextloud clients and apps are available for all platforms (configuration URL is https://math.dartmouth.edu/nextcloud).

8.6 Printers

Table below lists network printers within the department, as of August 2022 (the actual list is always at math.dartmouth.edu:631, which is a web interface to the printing service on `gauss`). Printers are on the **wired** network and that's where it's easiest to use them from. To print from wireless, each printer will have to be added individually to your wireless device. Please see News & Resources → Computing Resources → Printing.

Room #	Model	Name on network	IP address
104	Konica Minolta C759, color	104a	10.32.28.24
104	HP LaserJet 500 color M551	104b	10.32.28.25
226	HP LaserJet 600 M601DN	mwhp ("martiniwriter")	10.32.28.27
329	Konica Minolta C759, color	329a, 329a-twosided	10.32.28.21
329	HP LaserJet 500 color M551	ew ("emmywriter")	10.32.28.23

8.7 Large Format Printers

Math Department has two large-format printers:

- **Dürer** — HP Designjet color plotter in 226 Kemeny for printing large posters on a 36"-wide paper roll. Prepare your poster in PDF, actual size. Print from a Mac in room 226.

- **Escher** — Epson XP-15000 — in 104 Kemeny ("mail room"). Color inkjet printer capable of accurate color reproduction. Paper size up to 13×19 inches. Print from the iMac in room 104 using Acrobat Pro or Photoshop.

For assistance ask at help@math.dartmouth.edu.

8.8 Scanners

HP ScanJet flatbed scanner is available in room 104. It's driven from a nearby iMac. Konica Minolta multifunction devices in rooms 104 and 329 are scanners as well.

8.9 Computer Purchases

As a rule, **Apple** and **Windows** computers are purchased through Dartmouth Computer Store. Computers will have remote management software installed for remote access and support by the ITC. For support please use ITC portal services.dartmouth.edu to submit tickets for any issues or requests. For issues specific to Mathematics applications, *if they can't be resolved by the ITC*, please ask at help@math.dartmouth.edu. Please refer to the Mathematics Department Policy on Computer Purchases and Support for more info and possible exceptions.

If you prefer **Linux**, we can help with specifying and finding laptops, desktops, customized workstations and application servers. The latter can be placed in a secure, climate-controlled server room in Kemeny Hall.

9 Computer Backups

9.1 Department Linux Servers

Backups of personal and course accounts (and many other important directories) on servers are done nightly to two different network destinations, one of which is off-site. Seven daily snapshots are kept along with four weekly ones and as many of monthly snapshots as backup storage can hold. Snapshots of home directories and databases are taken hourly. 24 latest snapshots are kept.

9.2 Workstations

To set up a backup routine for your Linux workstation ask at help@math.dartmouth.edu. Mac/Windows can be backed-up using CrashPlan cloud service. This is configured by the ITC. Submit a ticket at services.dartmouth.edu.

10 Everything Else

We recognize that you will have questions about topics not covered in this document. Don't be shy about it. Simply post your question to help@math.dartmouth.edu.

Issues which are out of Mathematics Department's control should be addressed by submitting a ticket for the ITC by using their Service portal services.dartmouth.edu.