THE UNIVERSITY *of* EDINBURGH
School of Mathematics

Exam marking online

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Overview

- Context
- Guidance for students
- Marking process
- Plans for 2020/21

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Context

- Year 1 and Year 2 exams cancelled
- All others online
  - Open-book
  - Taken at a fixed time
  - Usual duration + 1 hour for submission
  - No-detriment policy

Guidance for students

Writing clear instructions

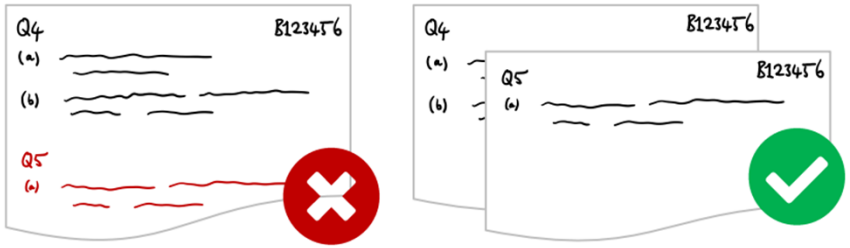
- Initial draft tested by colleagues and improved
- Ran a ‘dummy exam’ for all students
- Provided feedback against a list of criteria

Writing clear instructions

Step 2: Write your work

At the **top of each page**, write the **question number** at the top left, and **your exam number** at the top right:

Start your answer to each question on a fresh sheet of paper.



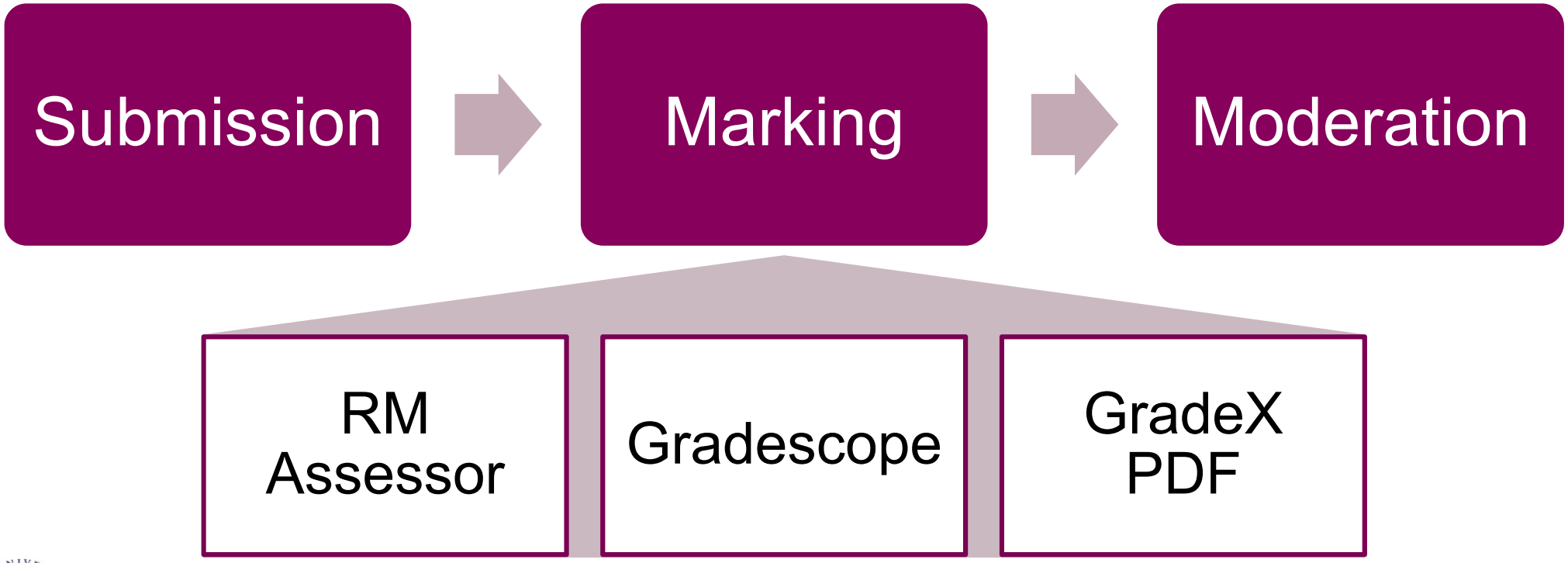
Points: 0.11 (11.00%) You put your Exam Number correctly on the top right of each sheet.	Points: 0 (0.00%) Please put your Exam Number on the top right of EACH sheet.
Points: 0.11 (11.00%) You correctly left out your student number.	Points: 0 (0.00%) Please DO NOT include your student number - use your Exam Number only.
Points: 0.11 (11.00%) The questions numbers are put on the top left of each page correctly.	Points: 0 (0.00%) Please put the corresponding question number on the top left of EACH sheet.
Points: 0.11 (11.00%)	Points: 0 (0.00%)

Submission

- Students allowed unlimited submissions for each exam
- Backup Microsoft Form in case of problems with Blackboard submission

Marking process

Marking workflow



Submission

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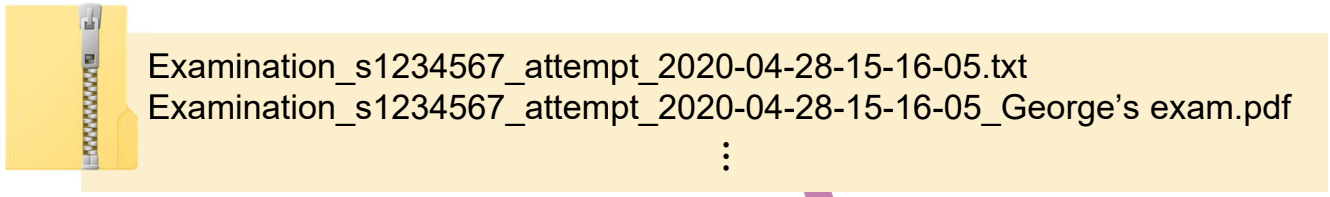
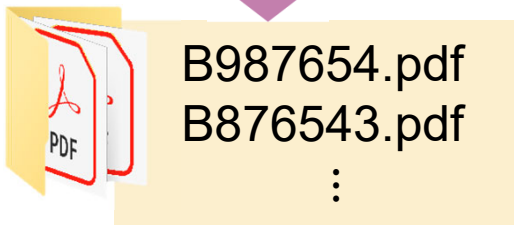
- Download all attempts as .zip
- Students are not anonymous



	A	B	C
1	UUN	Exam Number	Extra Time
2	S1234567	B987654	60
3	S2345678	B876543	

gradex-ingest.exe



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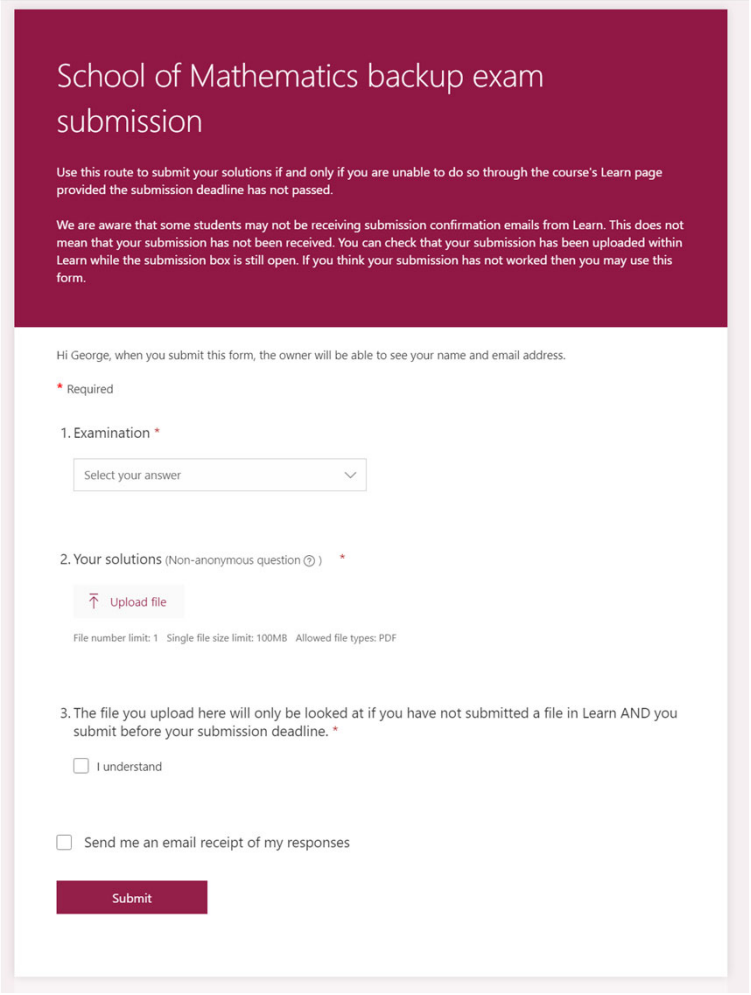
https://github.com/georgekinnear/gradex-ingest

Mopping up

- Assemble single PDFs (e.g. from uploaded JPEGs)
- Check the backup submissions form
  - 72 submissions in total



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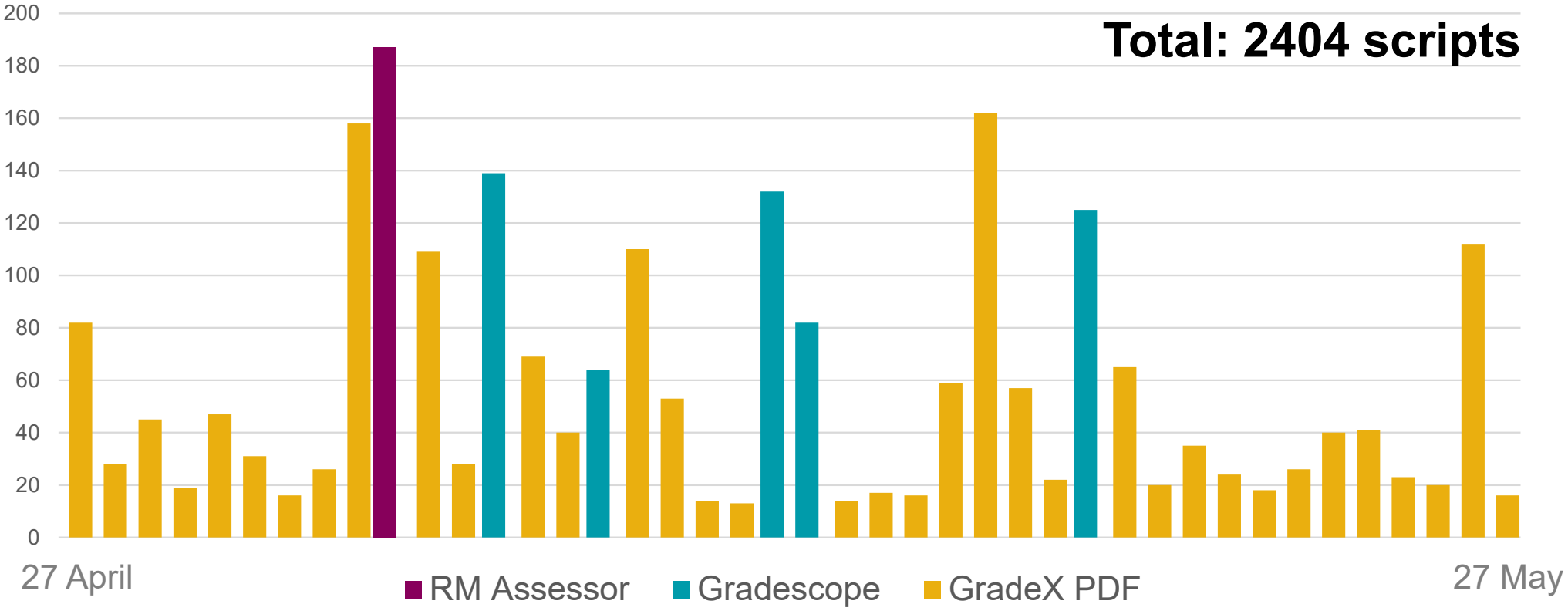
Marking overview



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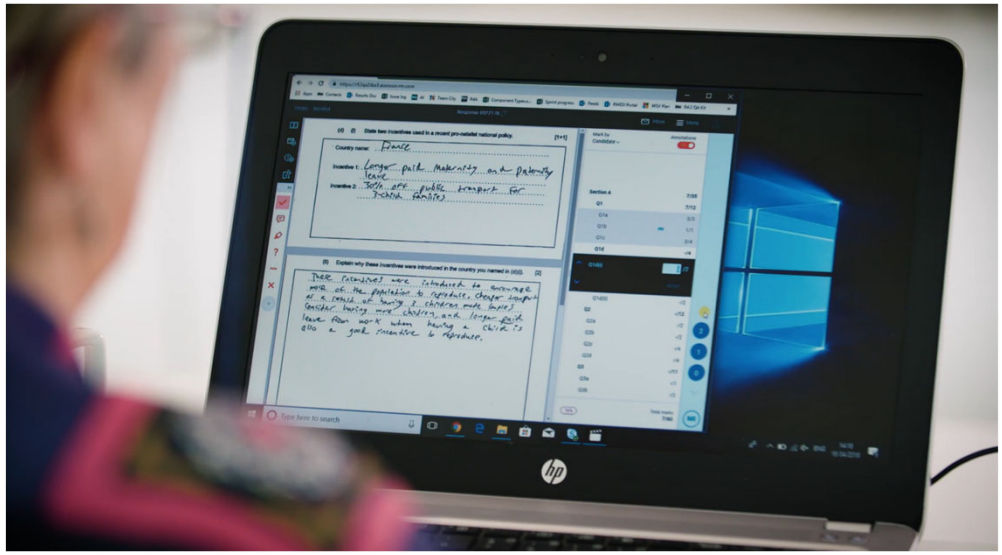
1

RM Assessor

- Used for high-stakes exams, e.g. IB, SQA
- “Proof of concept” for single course, with 180 scripts



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https://rmresults.com/digital-assessment-solutions/rmassessor

1

RM Assessor

Zoning

- Marking up locations of question parts
- PhD students, took 6 hours for 180 scripts

Marking

- Q1 split between 2 PhD students (10 example generation items)
- Q2-4 marked by lecturer

Checking

- Lecturer review of Q1 marking

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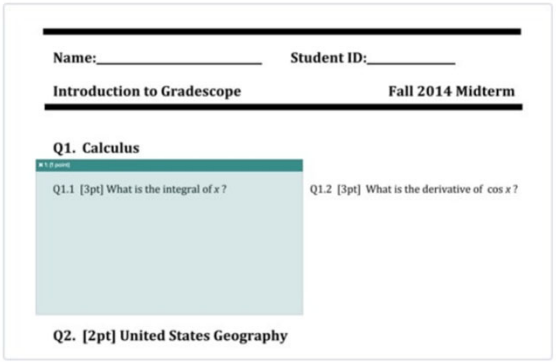
2

Gradescope

- Split up exams by question
- Grade using rubrics



Name:_____ Student ID:_____

Introduction to Gradescope Fall 2014 Midterm

Q1. Calculus

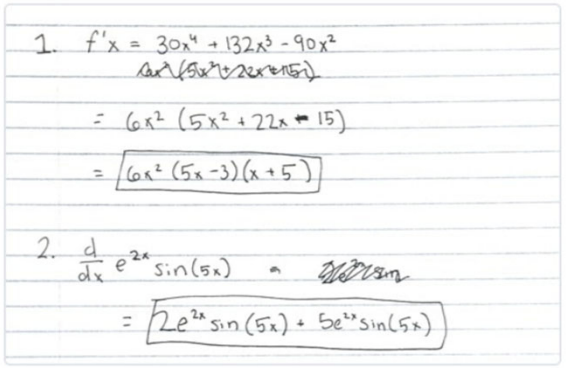
Q1.1 [3pt] What is the integral of x?

Q1.2 [3pt] What is the derivative of $\cos x$?

Q2. [2pt] United States Geography

Exam / Quiz

Instructors administer an assessment then collect and scan student work. Students answer each question in designated regions.



1. $f'x = 30x^4 + 132x^3 - 90x^2$

$= 6x^2(5x^2 + 22x - 15)$

$= 6x^2(5x - 3)(x + 5)$

2. $\frac{d}{dx} e^{2x}\sin(5x)$

$= 2e^{2x}\sin(5x) + 5e^{2x}\sin(5x)$

Homework / Problem Set

Instructors specify a window of time that students can submit their work. Students upload their work via their phone or computer.

2

Gradescope

Upload & Zoning

- Uploaded by Colin Rundel, automated using R
- PhD students took about an hour per 20 scripts

Marking

- Lecturer develops rubric
- Marking team applies the rubric

Checking

- Lecturer review of marking

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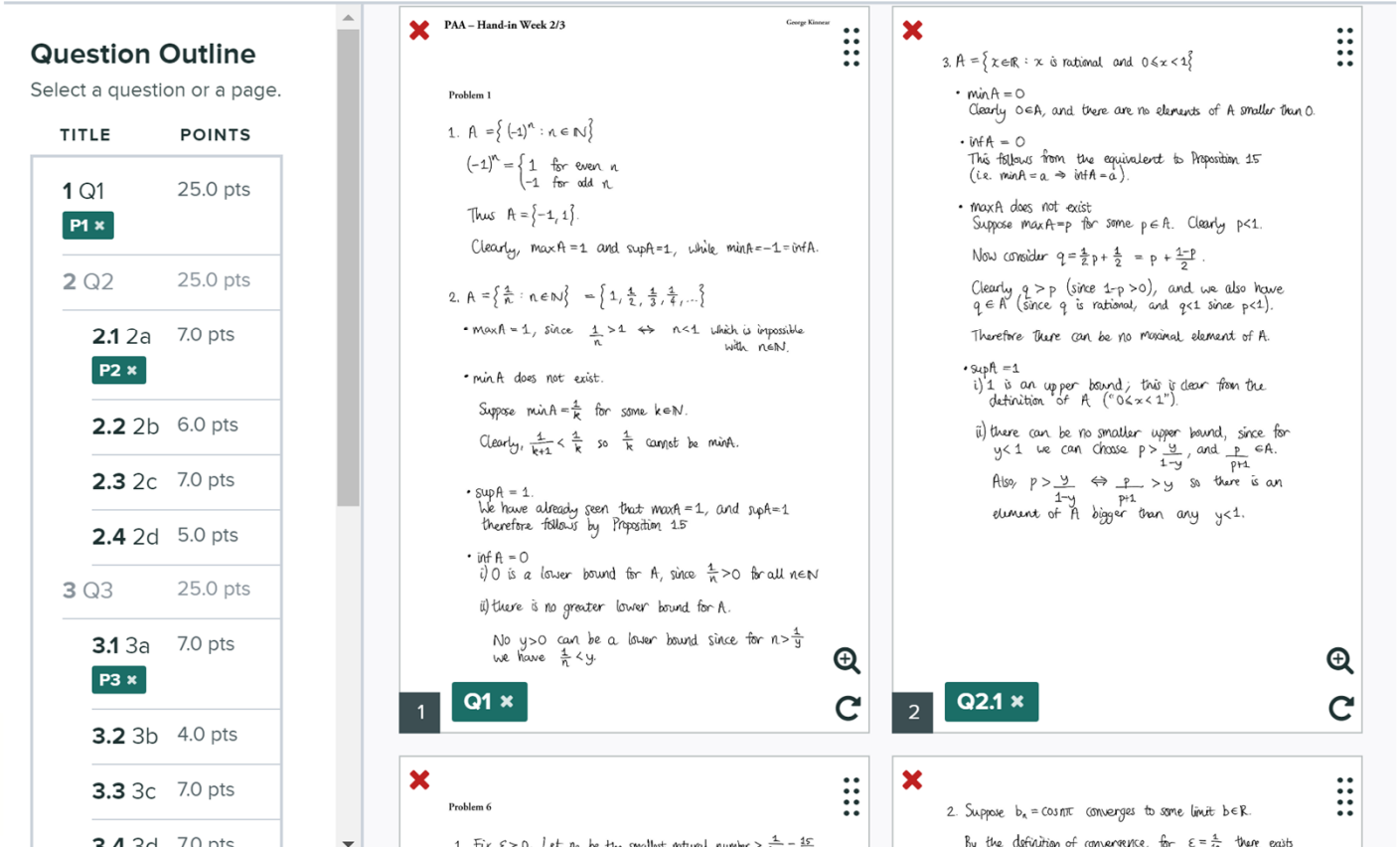
2

Gradescope

Exam | Assign Questions and Pages

SUBMITTED AT: **APRIL 15, 9:52 AM**

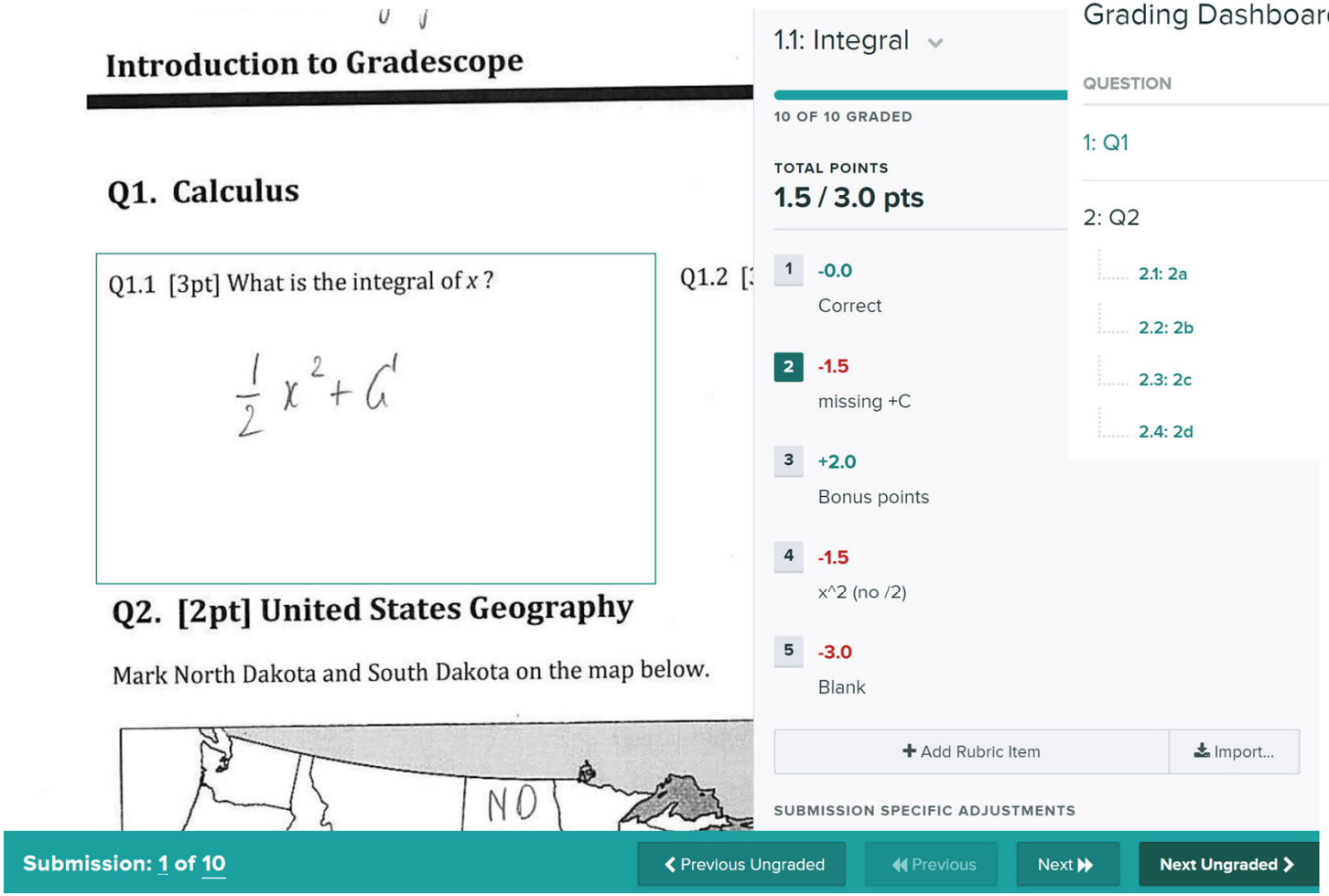
Select questions and pages to indicate where your responses are located. Use **esc** to deselect all items and hold **shift** to select multiple questions.



Zoning

2

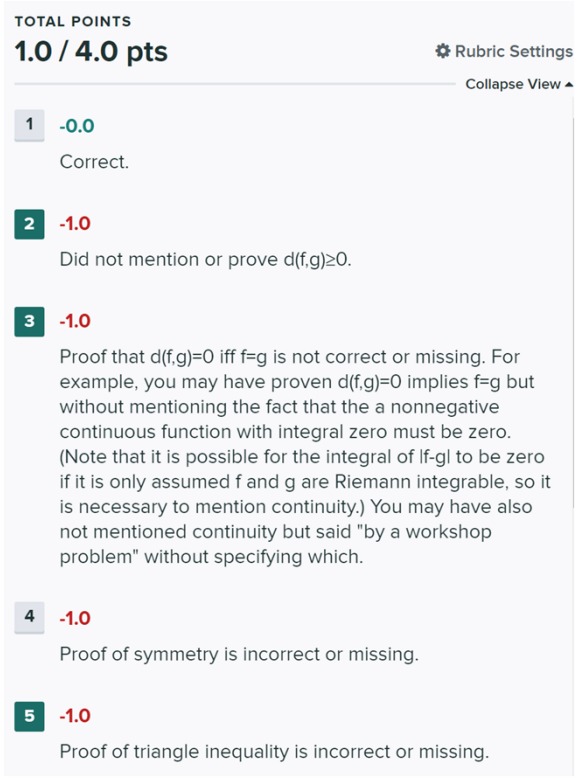
Gradescope



Marking

2

Gradescope


TOTAL POINTS

1.0 / 4.0 pts

Rubric Settings

Collapse View

1 -0.0

Correct.

2 -1.0

Did not mention or prove d(f,g)≥0.

3 -1.0

Proof that d(f,g)=0 iff f=g is not correct or missing. For example, you may have proven d(f,g)=0 implies f=g but without mentioning the fact that the a nonnegative continuous function with integral zero must be zero. (Note that it is possible for the integral of |f-g| to be zero if it is only assumed f and g are Riemann integrable, so it is necessary to mention continuity.) You may have also not mentioned continuity but said "by a workshop problem" without specifying which.

4 -1.0

Proof of symmetry is incorrect or missing.

5 -1.0

Proof of triangle inequality is incorrect or missing.

- Rubric using negative marking
- Can be tweaked during marking

Marking

2

Gradescope

MINIMUM	MEDIAN	MAXIMUM	MEAN	STD DEV
0.0	3.0	4.0	3.33	0.78

RUBRIC	POINTS	PERCENTAGE OF STUDENTS
Correct.	+ 0.0	46%
Did not mention or prove d(f,g)≥0.	- 1.0	1%
Proof that d(f,g)=0 iff f=g is not correct or missing. For example, you may have proven d(f,g)=0 implies f=g but without mentioning the fact that the a nonnegative continuous function with integral zero must be zero. (Note that it is possible for the integral of |f-g| to be zero if it is only assumed f and g are Riemann integrable, so it is necessary to mention continuity.) You may have also not mentioned continuity but said "by a workshop problem" without specifying which.	- 1.0	50%
Proof of symmetry is incorrect or missing.	- 1.0	1%
Proof of triangle inequality is incorrect or missing.	- 1.0	2%
No attempt or insufficient progress.	- 4.0	0%

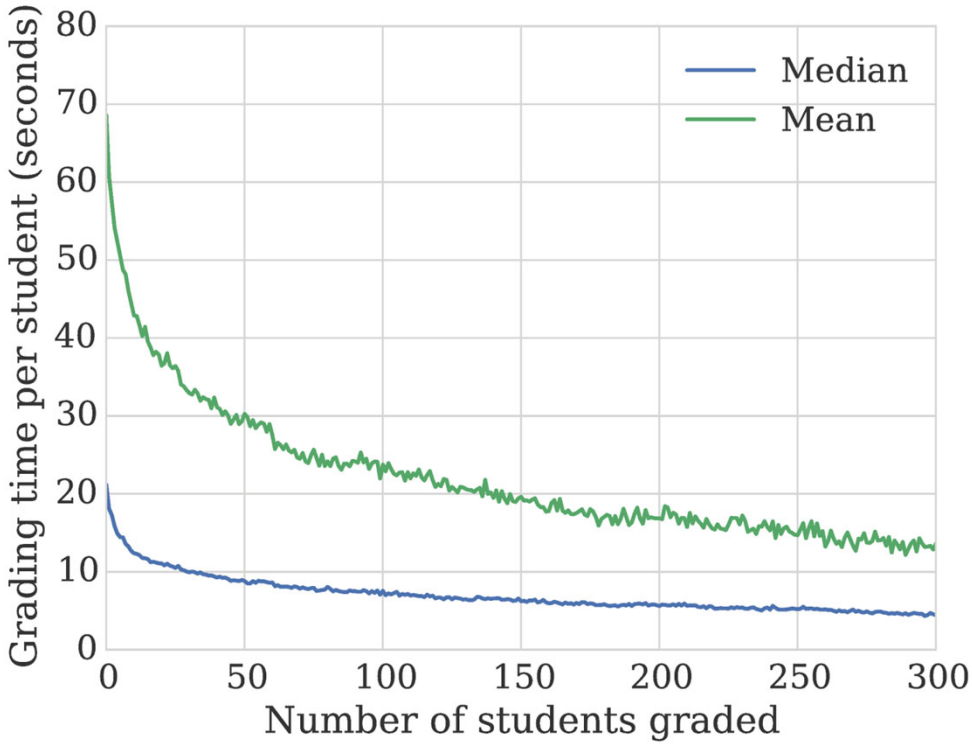
Checking

2

Gradescope

Positive feedback from markers:

- Rubrics easy to use
- Fast



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Singh, A., Karayev, S., Gutowski, K., & Abbeel, P. (2017). Gradescope: a Fast, Flexible, and Fair System for Scalable Assessment of Handwritten Work. https://doi.org/10.1145/3051457.3051466

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GradeX PDF

- Adding forms to the student PDFs
- Marks read out of the PDF into a spreadsheet
- Rapid development by Tim Drysdale

https://github.com/timdrysdale

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https://pdf.gradex.io/

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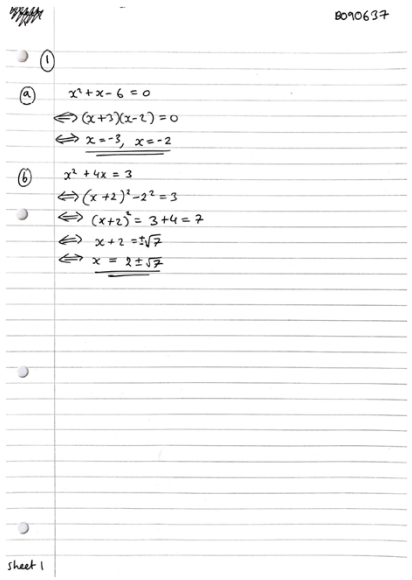
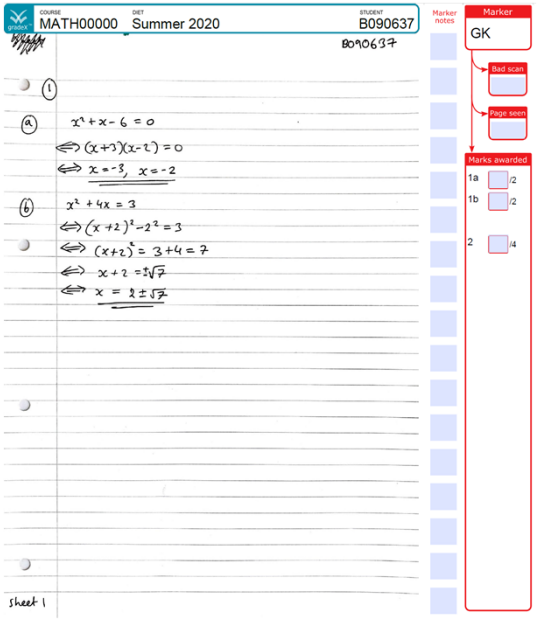
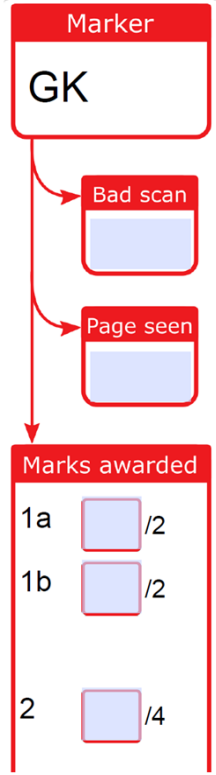
GradeX PDF

Our version of the process:



gradex-overlay





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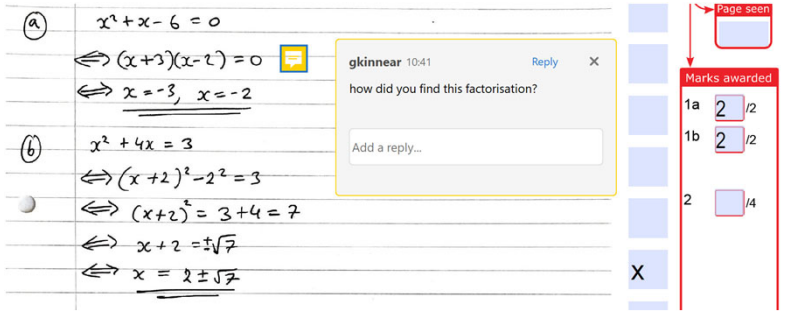
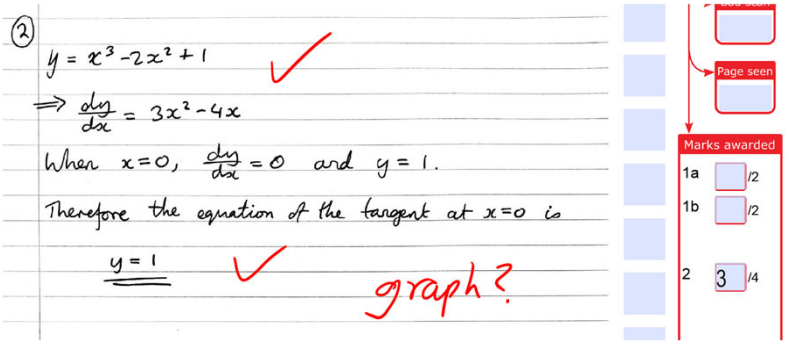
https://github.com/georgekinnear/gradex-overlay

3

GradeX PDF





check-marking

Exam:	MATH00000				
Marker:	GK				
	1a	1b	2	Total	
out of:	2	2	4	8	
mean:	1.2	1.33	3	4.75	
mean (%):	60	66.7	75	59.375	
Validation problems (3 scripts):					
Exam Num	1a	1b	2	Total	Validation
B075837	1	0.5	4	5	1b: noninteger mark
B093651	1 + 1	1	2	5	1a: multiple marks
B094191	1	1		2	2: not marked
Marking completed (1 scripts):					
Exam Num	1a	1b	2	Total	Validation
B090637	2	2	3	7	
Yet to be marked					
B097880					
B099142					
B101814					

Validation messages:

- Non-integer marks
- Marks outside range
- Multiple marks
- Missing marks

https://github.com/georgekinnear/gradex-extract

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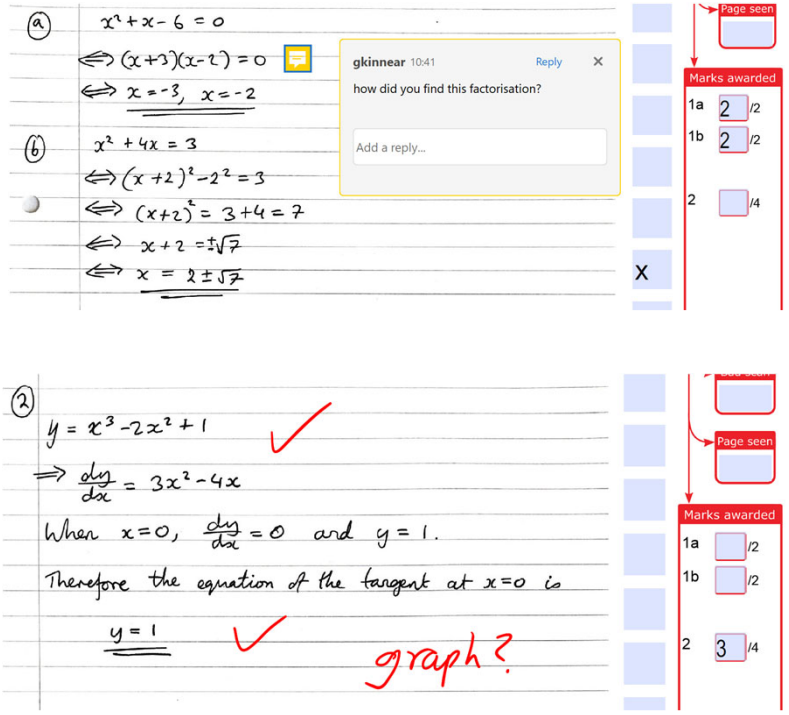
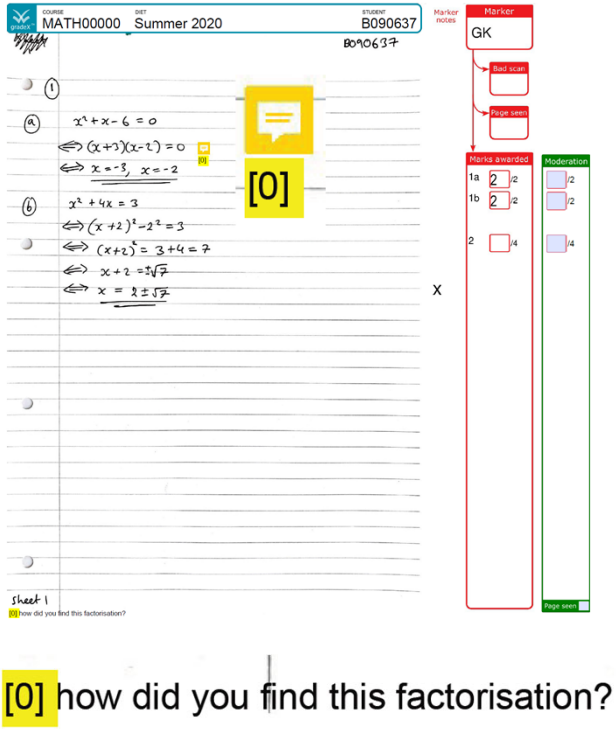
GradeX PDF



gradex-overlay



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https://github.com/georgekinnear/gradex-overlay

3

GradeX PDF

- SharePoint to store files
- Marking on iPad: OneDrive app
- Test your PDF viewer!

Moderation

- Checking process – less arithmetic!
- Paperless exam board:
  - Marking spreadsheets readily available
  - Borderline scripts easy to find

Plans for 2020/21

A growing need…

- December exams – remote again
- In-course assessment (e.g. midterms)
- Low-stakes hand-in work

Issues to address…

- Zoning – devolve to students
  - Gradescope?
  - Mix of STACK and human marking?

    See “Human marking” at https://eams.ncl.ac.uk/moodle/course/view.php?id=5
- Streamlining the admin process
- Usability for markers

Thank you!

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