

MATLAB EXPO 2018

Cody Coursework Workshop **Auto-Evaluation Framework** **for MATLAB Assignments**

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Before we start – a few questions

- How do you test learning of concepts?
- Which are courses with most potential for use of MATLAB?
- How do you typically evaluate code submitted by students?
- Is evaluation of code time-consuming?
- How would you ideally like to be using your time?
- How do you keep your students engaged?

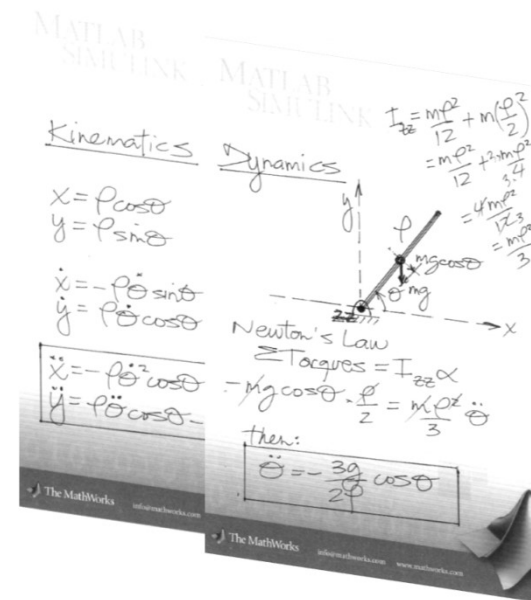


Choose a problem in your field

- Choose a problem in your field
 - Electrical and Electronics – Signal Generation
 - Mechanical – Mass Spring Damper
 - Mathematics – Numerical Integration

- What is the expected solution?

- **How do you check the solution for correctness? – Give test cases**



Agenda

- Cody Coursework – Introduction
- Walkthrough
 - Student – Solving the assignment
 - Faculty - Setting up the course and the assignment
- Hands-on Experience

What is Cody Coursework?

- Cody Coursework helps faculty automate evaluation/grading of MATLAB programming assignments

The screenshot shows the Cody Coursework interface in a browser. The address bar indicates the URL is `https://coursework.mathworks.com`. The page has a blue header with the 'Cody Coursework' logo. On the left, there is a 'Login' section with a 'Log In' button and a link for 'Don't have a MathWorks Account'. A sidebar on the right lists various MATLAB exercises, with 'Determine whether a vector is monotonically increasing' selected. The main content area displays the problem title, a 'Problem Summary' section with instructions and examples, and a 'Student Solutions' section with a plot showing a single data point at approximately (1, 15).

Cody Coursework

- Visual environment for creating MATLAB problem sets
- Allows instructors to set up MATLAB assignments and automatically evaluate/grade them
- Allows students to test their solutions against the computer obtaining immediate feedback

Potential for usage in:

Homework assignments

Exams

Practical sessions

Many others (e.g., learn MATLAB, share problems)

A Walkthrough

<https://coursework.mathworks.com>

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Riddhi Ghosh ▾

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My Courses
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Professors

Cody Coursework Course - Signal Processing >
Signal Generation and Smoothing >

Signal Generation - Sine Wave
Edit | Rescore Solutions | Delete

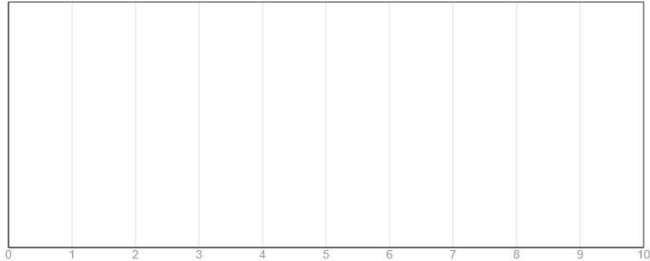
Problem Summary

Create a 3 second duration 10Hz sinusoid tone which has 500 samples per second. Store the time vector corresponding to the signal in *t* and the signal in *x*.

Learner Preview

Student Solutions

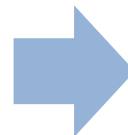
View Student Solutions



Workflow

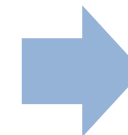
Faculty creates a course in Cody Coursework

- Assignments with Problem Sets
- Invites Students to the course



Student receives an email with an invite to the course

- Assignments with problems sets due on a particular date
- Students solves the problems, gets instant feedback and submits the assignment



Learning analytics

- Faculty is able to see how many students attempted the problems in the assignment, how many got it correct, number of attempts
- Faculty also able to download the MATLAB code submitted and the submission data in CSV format

Week 1 - To: James Pike
Subject: [Cody Coursework] Introduction to Numerical Methods

Create

To ensure our e-mails reach your inbox, add the domain @mathworks.com to your safe sender list.

Cody Coursework™

Description

Prof. Sandra Hume is inviting you to attend **Introduction to Numerical Methods** in Cody Coursework!

To get started, click: [View Invitation](#)

Please do not forward or share this link.

Course Access

You need a MathWorks Account to access this course. If you don't have an account yet, Cody Coursework will help you create one.

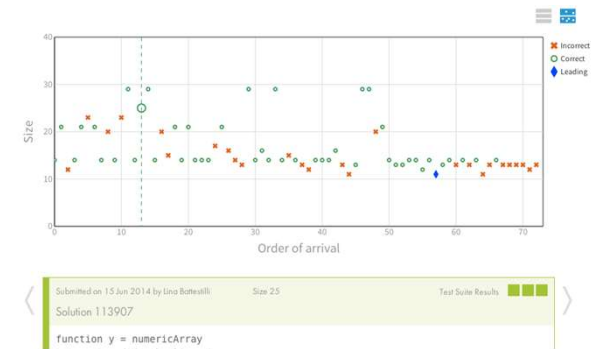
Week 1 - Data Types

```
y = [1:10]';
end
```

View Map Improve Your Solution

Test Suite

TEST	RESULT	CODE INPUT
1	Pass	%% Check one of the elements y = numericArray; assert(isequal(y(7),7),... 'Make sure it is an array containing numbers 1,2...10.');
2	Pass	%% Check all elements assert(isequal(prod(numericArray),prod(1:10)),... 'Make sure it is an array containing numbers from 1 to 10.');
3	Pass	%% Check if the array is of the right dimension assert(isequal(size(numericArray),[10, 1]),... 'Make sure it is a COLUMN vector of size [10, 1].');



Key points to be noted

<https://coursework.mathworks.com>

MathWorks hosted

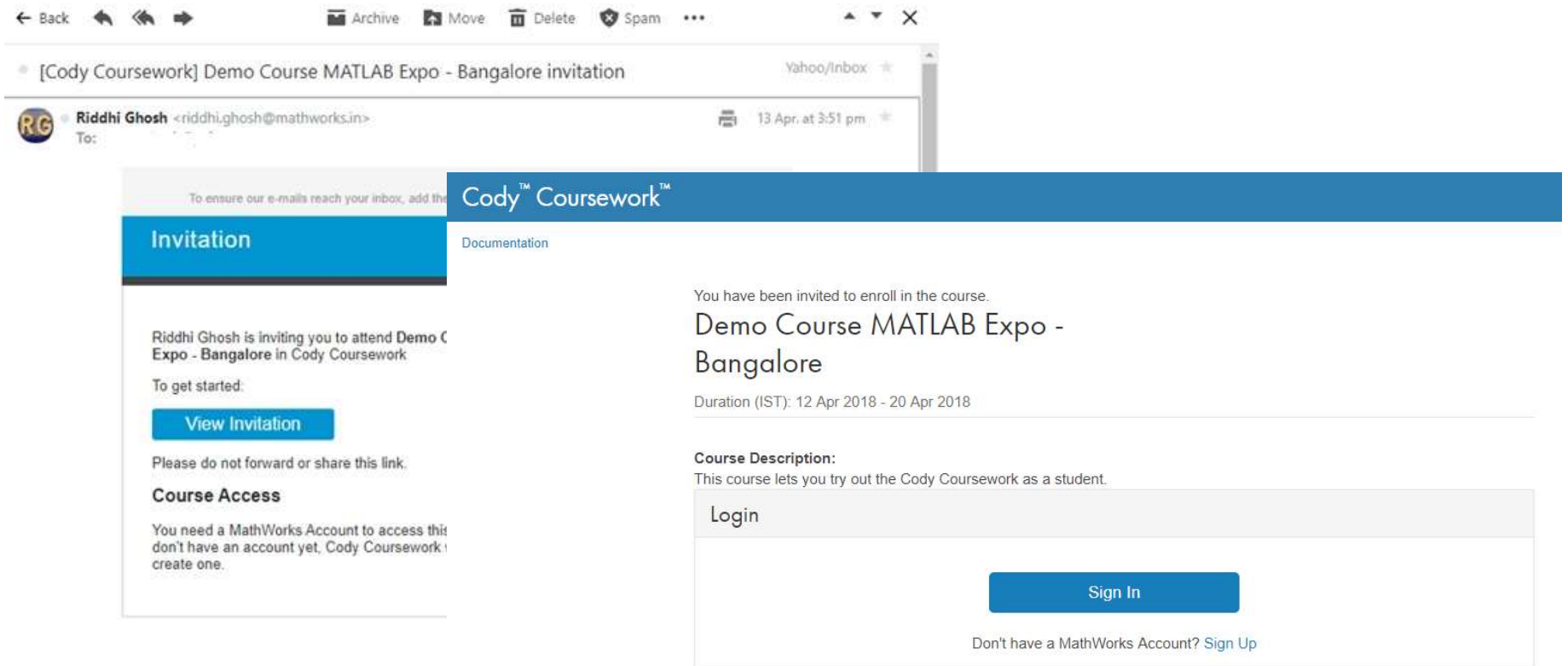
Runs a cloud version of MATLAB – No local installation of MATLAB necessary

Cody Coursework – Student Workflow



Cody Coursework – Student Workflow

1. Receive an Invitation

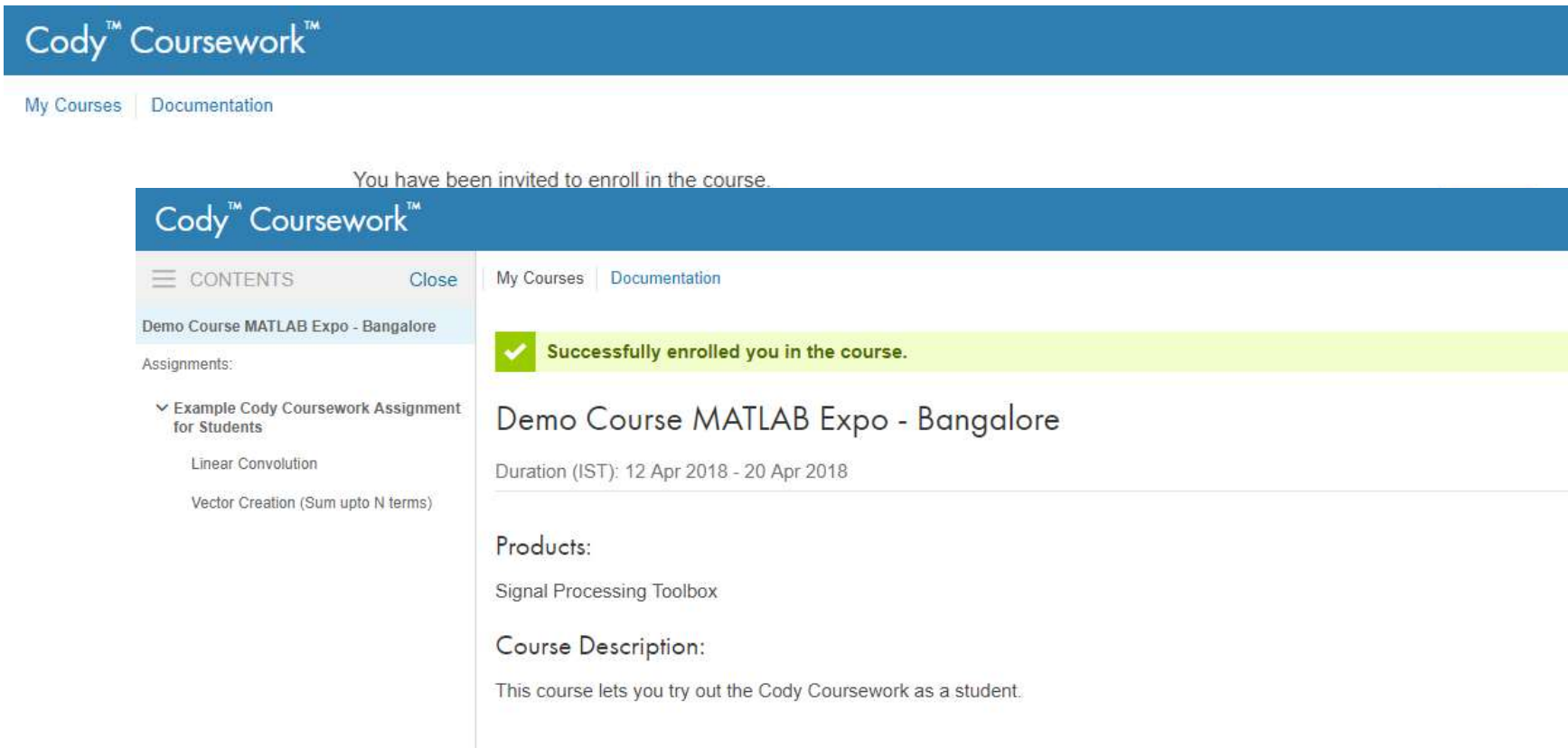


The screenshot shows an email interface with the following content:

- Subject:** [Cody Coursework] Demo Course MATLAB Expo - Bangalore invitation
- From:** Riddhi Ghosh <riddhi.ghosh@mathworks.in>
- Date:** 13 Apr. at 3:51 pm
- Header:** Cody™ Coursework™
- Section: Invitation**
 - Riddhi Ghosh is inviting you to attend **Demo Course MATLAB Expo - Bangalore** in Cody Coursework
 - To get started: [View Invitation](#)
 - Please do not forward or share this link.
- Section: Course Access**
 - You need a MathWorks Account to access this. If you don't have an account yet, Cody Coursework will help you create one.
- Main Content:**
 - You have been invited to enroll in the course.
 - Demo Course MATLAB Expo - Bangalore**
 - Duration (IST): 12 Apr 2018 - 20 Apr 2018
 - Course Description:** This course lets you try out the Cody Coursework as a student.
 - Login** section with a [Sign In](#) button.
 - Text: Don't have a MathWorks Account? [Sign Up](#)

Cody Coursework – Student Workflow

2. Enroll



The screenshot shows the Cody Coursework interface. At the top, a blue header contains the text "Cody Coursework" and "Riddhi Ghosh". Below this, a navigation bar includes "My Courses" and "Documentation". A message states "You have been invited to enroll in the course." A sidebar on the left lists "CONTENTS" with a "Close" button, and "Demo Course MATLAB Expo - Bangalore" with a list of assignments: "Example Cody Coursework Assignment for Students", "Linear Convolution", and "Vector Creation (Sum upto N terms)". The main content area displays a green success message: "Successfully enrolled you in the course." Below this, the course details are shown: "Demo Course MATLAB Expo - Bangalore", "Duration (IST): 12 Apr 2018 - 20 Apr 2018", "Products: Signal Processing Toolbox", and "Course Description: This course lets you try out the Cody Coursework as a student."

Cody Coursework – Student Workflow

3. Open an Assignment

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Demo Course MATLAB Expo - Bangalore

Assignments:

- ▾ Example Cody Coursework Assignment for Students
 - Linear Convolution
 - Vector Creation (Sum upto N terms)

My Courses | Documentation

Demo Course MATLAB Expo - Bangalore >

Example Cody Coursework Assignment for Students

Visible: 12 Apr 2018 12:00 AM IST **Due:** 19 Apr 2018 10:00 PM IST

Submissions Per Problem: 2

Try out this assignment to get a feel of how the students will attend a course.

Problems

- Linear Convolution

- Vector Creation (Sum upto N terms)

Cody Coursework – Student Workflow

4. Solve Problems

Demo Course MATLAB Expo - Bangalore > Example Cody Coursework Assignment for Students >

Linear Convolution

0 solutions submitted (max: 2)

Given two discrete time-domain signals x and h , compute the linear convolution of x and h using the definition of convolution and store it in y .
Use the mathematical formula for convolution of two signals.

Your Function

Assessment Run Pretest ? Submit (Attempt 1 of 2) ?

Test 1 (Click Submit to run.)

Assessment Run Pretest ? Submit (Attempt 1 of 2) ?

Test 1 (Click Submit to run.)

> ✔ **Test 2** (Pretest)

Cody Coursework – Student Workflow

5. Submit Solutions

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Demo Course MATLAB Expo - Bangalore > Example Cody Coursework Assignment for Students >

✔ **Linear Convolution**

2 solutions submitted (max: 2) | [View my solutions](#)

Solution Details

Solution 2: All tests passed

Test Results

Submitted less than a minute ago | ID: 7416636 | Size: 14

```
1 function y = LinConv(x,h)
2     y=conv(x,h);
3 end
```

Improve This Solution
My Solutions

Assessment: Correct

✔ **Test 1**

>
✔ **Test 2** (Pretest)

Cody Coursework – Student Workflow

6. Check Progress

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My Courses | Documentation

Demo Course MATLAB Expo - Bangalore > Example Cody Coursework Assignment for Students >

✔ **Linear Convolution**

2 solutions submitted (max: 2) | [View my solutions](#)

My Solutions

Sort by: View as: [List](#) | [Map](#)

Solution 2: All tests passed Test Results ✔✔

Submitted 3 minutes ago | ID: 7416636 | Size: 14

```

1 function y = LinConv(x,h)
2     y=conv(x,h);
3 end
                    
```

Solution 1: 0 of 2 tests passed Test Results ✘✘

Submitted 3 minutes ago | ID: 7416630 | Size: 14

```

1 function y = LinConv(x,h)
2     y=cov(x,h);
3 end
                    
```


Cody Coursework – Student Workflow

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Demo Course MATLAB Expo - Bangalore

Assignments:

- ▾ Example Cody Coursework Assignment for Students
 - Linear Convolution
 - Vector Creation (Sum upto N terms)

My Courses
Documentation

Demo Course MATLAB Expo - Bangalore >

Example Cody Coursework Assignment for Students

Visible: 12 Apr 2018 12:00 AM IST **Due:** 19 Apr 2018 10:00 PM IST

Submissions Per Problem: 2

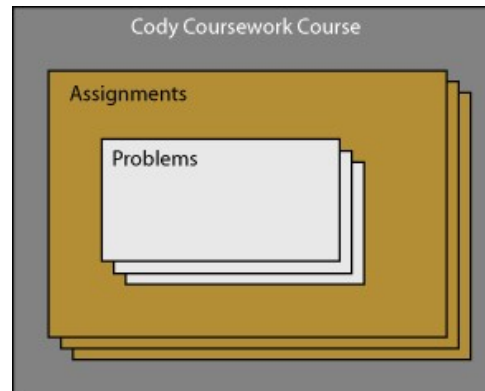
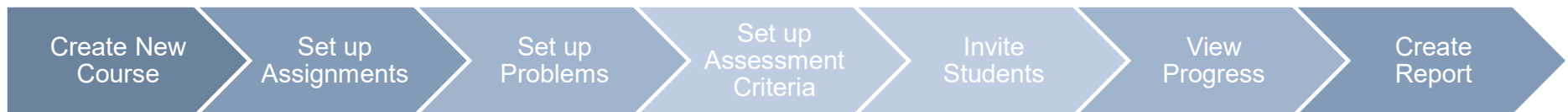
Try out this assignment to get a feel of how the students will attend a course.

Problems

Linear Convolution

Vector Creation (Sum upto N terms)

Cody Coursework – Instructor Workflow



Course Setup Demo

Cody Coursework – Assessment Workflow

Student Submissions

Demo Course MATLAB Expo - For Testing >

Example Cody Coursework Assignment for Students

Visible: 12 Apr 2018 12:00 AM IST Due: 19 Apr 2018 10:00 PM IST

Submissions Per Problem: 2

[Edit](#) | [Copy](#) | [Report](#) | [Delete](#)

Try out this assignment to get a feel of how the students will attend a course.

Problems

Linear Convolution



Vector Creation (Sum upto N terms)



Cody Coursework – Assessment Workflow

Solutions Map

Demo Course MATLAB Expo - For Testing > Example Cody Coursework Assignment for Students >

Linear Convolution

[Edit](#) | [Copy](#) | [Rescore Solutions](#) | [Delete](#)

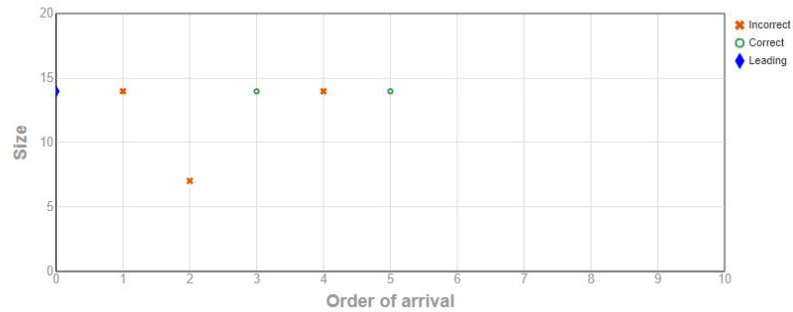
Student Solutions

Search:



View as:

[List](#) | [Map](#)



Click on any solution marker in the graph to display solution in this box.

Cody Coursework – Assessment Workflow

Rescore Solutions

Demo Course MATLAB Expo - For Testing > Example Cody Coursework Assignment for Students >

Linear Convolution

[Edit](#) | [Copy](#) | [Rescore Solutions](#) | [Delete](#)

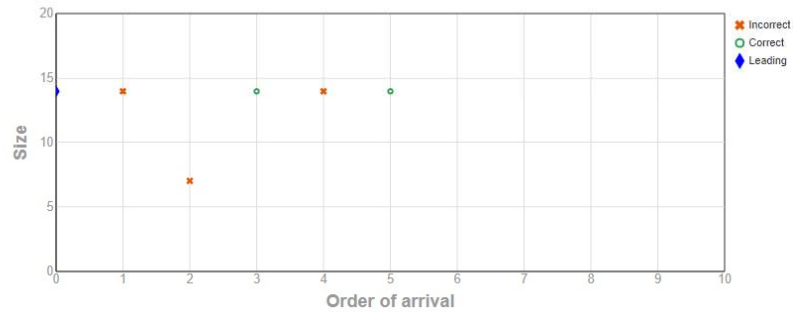
Student Solutions

Search:



View as:

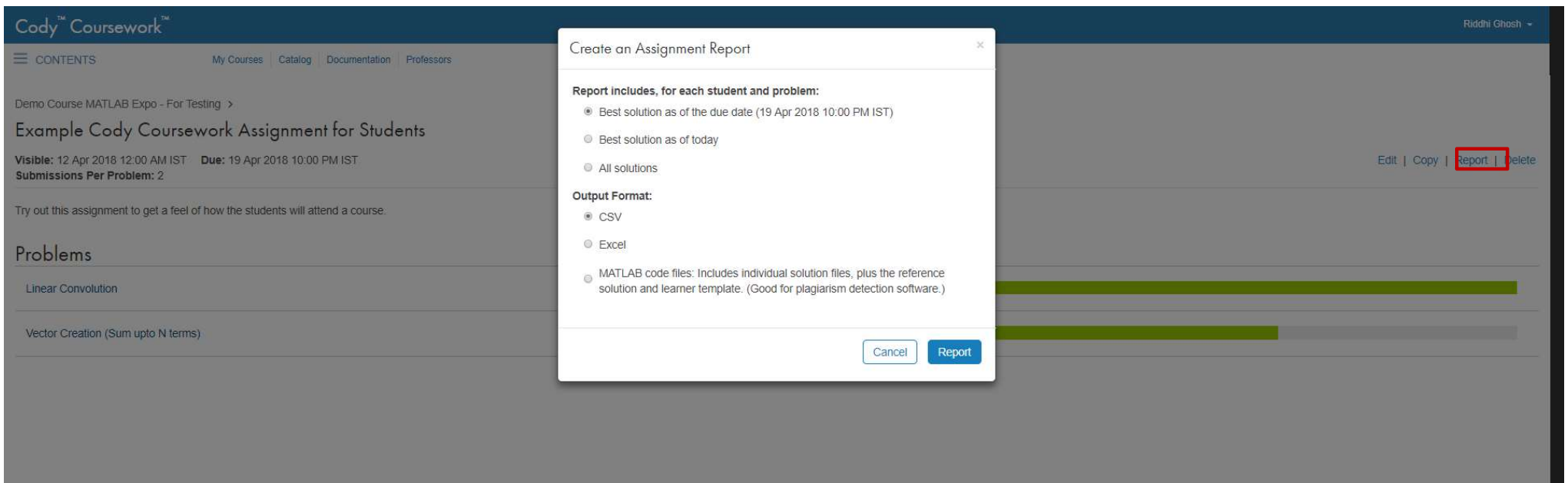
[List](#) | [Map](#)



Click on any solution marker in the graph to display solution in this box.

Cody Coursework – Assessment Workflow

Create Reports



The screenshot displays the Cody Coursework interface. A modal dialog box titled "Create an Assignment Report" is open in the center. The dialog contains the following options:

- Report includes, for each student and problem:**
 - Best solution as of the due date (19 Apr 2018 10:00 PM IST)
 - Best solution as of today
 - All solutions
- Output Format:**
 - CSV
 - Excel
 - MATLAB code files: Includes individual solution files, plus the reference solution and learner template. (Good for plagiarism detection software.)

At the bottom of the dialog are "Cancel" and "Report" buttons. In the background, the course page for "Example Cody Coursework Assignment for Students" is visible, with the "Report" button in the top right corner highlighted by a red box.

Cody Coursework - Benefits

	Benefits
1. Auto-grade MATLAB Scripts and Functions	Saves time on grading
2. Immediate Student Feedback	Student engagement
3. Learning Analytics	Improves student learning outcomes

Resources

- <https://coursework.mathworks.com/>
- <https://in.mathworks.com/academia/cody-coursework>
- <https://in.mathworks.com/videos/matlab-cody-coursework-setting-up-a-course-92602>

Use Case at Technical University Eindhoven

- [TU Eindhoven](#)

Professor Quote: I am advocating for expanded use of Cody Coursework at TU/e. As some of my colleagues have already discovered, for any course that uses MATLAB, Cody Coursework is a highly effective tool that saves time and work and fully engages students in the course assignments.

- *“The fact that you can get immediate feedback (or confirmation) on a quite complicated piece of code is really neat, and without it, debugging your own code would really be a mess. It also **motivated me to get 100% score on all the MATLAB assignments.**” Joost P.*
- *“Cody Coursework is a great platform. It gives me **more confidence about my solution** rather than waiting for the instructor evaluation.” Manoj P.*
- *“My experience with Cody Coursework was very positive. The **green checkboxes are an extra motivation to get a high grade.**” Koen B.*
- *“The most useful feature of Cody Coursework was the ability to check our solutions against various test cases, which helped in **debugging our code and formulating it in a much more generalized manner.**” Amrith V*
- *“I like that you receive feedback immediately, which makes it much easier to find problems in your code... I **learned a lot from the MATLAB assignments in a relative short period.**” Ruud S.*

Call To Action

- Identify use of MATLAB in your coursework and assignments
- Look at Cody Coursework documentation to learn more about how to create a course
- Reach out to us if you need help setting up a course
 - Riddhi.Ghosh@mathworks.in
 - Ramanuja.Jagannathan@mathworks.in
 - Viju.Ravichandran@mathworks.in