Active Learning 101: A guide for new instructors in large classrooms

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Contents

1 What is this guide?

This guide is intended to help new instructors effectively use classroom response questions in large classes like the first year Calculus and Linear Algebra offerings at the University of Toronto. The authors of this guide, a group of grad students and postdocs, found that carefully crafted questions create one of the best opportunities to foster engagement in these classes with hundreds of students. This guide records some of our greatest successes and failures for you to learn from too. We have included many examples from questions we used in class that we thought went well. (Note that the layout of the text in these questions had to be modified to go from fitting on a projector to fitting in a document)

In particular, this guide will give some examples from the "TopHat" classroom response system. However, the principles here potentially translate to any kind of active learning environment where instructors give students in class time to work on problems.

2 Think-Pair-Share

"Think-Pair-Share" is the most basic and easy to use protocol to incorporate active learning in your class. We found it very effective to devote most of in-class time to this type of question asking, and only do little mini-lectures (usually no longer than 15 minutes) between questions.

2.1 Basic protocol

1. **(Think)** Instruct students to try the problem *on their own* for a short amount of time (usually somewhere between 1 and 5 minutes).
2. Reveal the student responses on the classroom response system. (Note: Do not reveal the correct answer to the students yet!)
   (a) If most students have the correct answer ($> 70\%$), the students are understanding this question well! You can briefly explain the answer and move on.
   (b) If many students are on the wrong track ($< 30\%$ correct), you have identified something the students are not fully understanding. This is a great opportunity for the students to learn! Depending on how you feel about the level of student understanding, you may wish some hints and/or revisit the concept being tested before moving on to the next step.
3. **(Pair/Share)** Instruct students to talk to the other *students nearby them*, and *share* their ideas. Reopen the classroom response system so they can put in *new responses*.
4. **(Share)** Reveal the student responses again.
   (a) If most students have the correct answer (> 70 %), you can briefly explain the answer and move on.
   (b) Otherwise, you can call on individual students to explain their thinking. With your moderation, the resulting classroom discussion should uncover any misconceptions the students are having.
5. Reveal the correct answer and clearly summarize the correct solution to the problem.

2.2 Tips and tricks

While students are working you should circulate among the students. You have three important jobs to do:

1. Spy on the students work and eavesdrop on their conversations. What are they understanding very well? What are they misunderstanding?
2. Make sure students are on task. Its perfectly acceptable to ask an idle student what they think about the problem to get them working.
3. Answer student questions. Many students feel more comfortable asking you a question one-on-one rather than in front of a giant class. Very often, the question is a really good one, and you can repeat the question and answer for the whole classroom.

The last step, revealing the correct answer, is very important for students taking notes. By the end of the protocol, you should make students can see the correct answer in the classroom response system (by clicking "reveal correct answer") and/or writing it on the board. Its often a good idea to write something about the *why* the answer is correct on the board too. Directly copying down what students say in the discussion onto the board is a great way to do this.

You can also record common student misconceptions on the board. This makes it more likely these will end in the student notes so that students will see them when they are studying and remember the classroom discussion. Make sure to label these clearly so students don't get mixed up between what is True and what is False.

More than one round of the "Pair/Share" can be used! A common hint you can give students between rounds is to eliminate an incorrect line of thinking and then ask them to rethink. (See example below)

Questions that students get wrong at first often lead to more learning than questions that students all get right. Don't be scared to stretch your students and give them problems they will struggle with at first! Students pay extra attention to questions they get wrong at first and collectively struggling through hard problems with your guidance is one of the best ways you can use lecture time. (See section on question genre's for lots of ideas)

Learning the art of how much time to give students can be tricky and takes some practice. It's worth thinking about how many minutes you plan on spending on each question before class so you can make sure you don't fall too far behind. Good discipline with timers can also help you manage the transition from students talking to each other to students paying attention to you at the board. (See section on timers and timing for some tips)

In multi-section courses, connect with other instructors for the course. You can reuse the same questions between your sections and also have really productive tips for each other about what students are having a hard time with and what is working or not working. This can save you a lot of time!

The basic protocol can work well at the very beginning of class: you can put the question up as students are filing in and then start the timer at the start of class. This is particularly excellent if students are responsible for preclass reading. It also works well after a definition or mini-lecture to give students a chance at thinking with the new ideas you've introduced.

2.3 A complete play-by-play example

Setting: A first year calculus course without proofs (e.g. MAT135 at U of T). Students have seen definitions for limits but have not had much practice with the conceptual idea of a limit in tricky situations.
Learning Goal: Understand *why/how* a limit might not exist.
TopHat Question: (students responses after second round of voting are shown)

How this played out in class

1. Prof: "We've seen some limits where you can plug in directly to evaluate the limit. Here's one that is not so straightforward! Take a minute and try to work this one out by yourself."

2. 1 minute timer set on TopHat; students work quietly for 1 minute. Prof circulates around the room to make sure students are on task. When there are 15 seconds left the Prof gives a reminder: "15 seconds left, if you aren't sure at this point, take your best guess!"

3. Answers from first round of voting are revealed. Many students have chosen option "a" in the first round of voting. The answers are pretty evenly split among other answers.

4. Prof: "It looks like a lot of you chose option A, that the limit exists and equals 1 ". Remember from our definitions of a limit, that if the limit exists it must be some number. In the textbook definition, we called that number L." Prof shows a slide with the definition of a limit. "This means that Option A can't be correct!" Prof writes this on the board: "If limit exists, then $\lim_{x\,!\,0} \frac{1}{x^2} = L$ for some real number L,) Option A is False."

5. Prof: "I'm going to give you a chance to revote now! This time, talk to the people around you and see what they think. I'll give you 2 minutes for this round. "

6. 2 minute timer set on TopHat; students work loudly talking to each other. Prof circulates around the room listening to student discussions and talking to students.

7. Prof: "Ok! Times up! Let's see what you guys think now" Answers from second round of voting are shown.

8. Prof: "It looks like the class is still pretty split between options B,C and D. Does anyone want to share why they voted for Option B or C?". Prof calls on a student who put their hand up.

9. Student: "We voted for Option B. We said that $x = 0$ is not in the domain of $\frac{1}{x^2}$, which means the limit does not exist"

10. Prof: "It's true that $x = 0$ is not in the domain, that part is definitely correct. Let's revist the definition of a limit and see what it says about that." Prof goes back to the slide with the definition of a limit "Here it specifically says that we look at x values close to but not equal to $x = 0$. This means that whether or not the function is defined at $x = 0$ will not have any effect on the limit at $x \to 0$. B is not correct. This is a common student misconception about the definition of a limit; it looks like a lot of you were thinking this way!" Prof writes "$x = 0$ in the domain is irrelevant for $\lim_{x \to 0} \Rightarrow$ Option B is False."

11. Prof: Anyone else want to share why they voted for Option C or D?" Prof calls on a student who put up their hand. Student: "We chose Option D, and wrote it doesn't exits *because* it's ∞."

12. Prof: "Oh interesting, so in other words when the limit is ∞, that means the limit does not exist. But wait a second, how do you know its ∞? What does it even mean for the limit to be ∞ in the first place?"

13. Student: "We graphed it, on the graph of the function it looks like its blowing up around $x = 0$."

14. Prof: "Great idea drawing the graph! This way of thinking is correct!" Prof clicks the Show Correct Answer button on TopHat to reveal the correct answer and writes on the board "The limit DNE because the value of the function gets larger and larger as $x \to 0$. It does not approach any fixed value L."

15. Prof: "This is one way a limit might not exist!" Prof moves on to the next topic: the definition of a limit being ∞ or $-\infty$ and explains why this means the limit can't exist and connects this to the students preconcieved notion of the limit being ∞.

3 Question genres

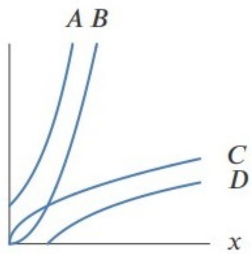
Here are some "genres" of questions we have had success with using in class. Most topics you want to cover could fit into any of these genres, but some will naturally suit some topics better. Additionally, rotating between these question types can help keep your classes different and interesting so it doesn't get monotonous for the students.

3.1 "Straightforward" questions

These questions are meant to be quick questions that essentially check if students have done the pre-class work, have a basic understanding of the definitions, or can handle the easier types of problems they might see. Straightforward is in quotes because many students will find these questions tough already; they are definitely worth going over.

Examples

Without a calculator or computer, match the functions e^x, $\ln x$, x^2, and $x^{1/2}$ to their graphs in Figure 1.58.



All results ▾

Most Popular Matches

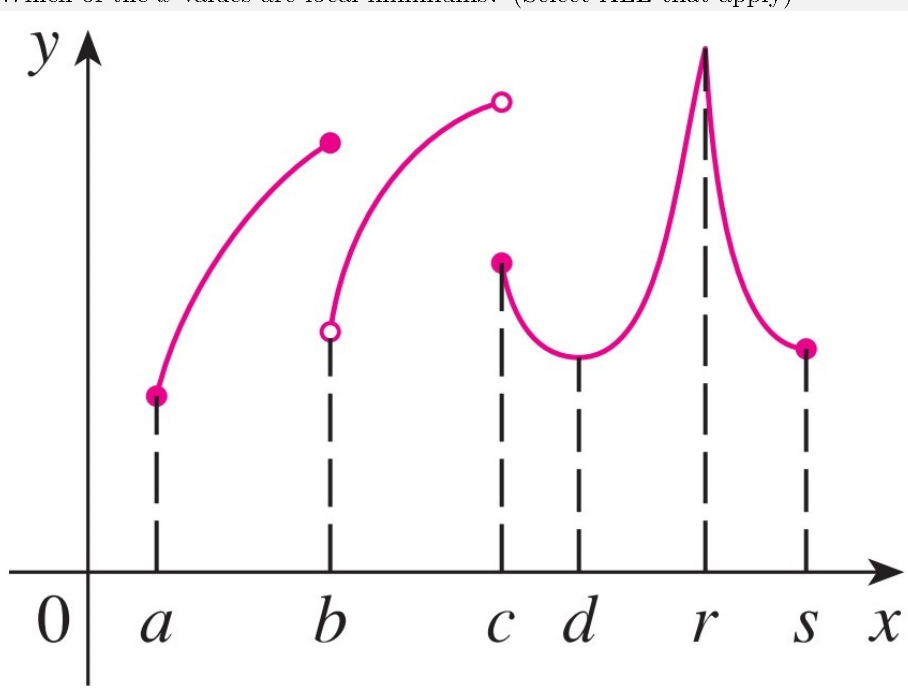
1	x^2	→	B	B
2	$x^{1/2}$	→	C	C
3	e^x	→	A	A
4	$\ln(x)$	→	D	D

What is $\frac{d}{dx}(\pi^7)$?

All results ▾

A	$7\pi^6$
B	$7\pi^7$
C	$6\pi^7$
D	Something else.

Which of the x values are local minimums? (Select ALL that apply)



Tips

The website `http://mathquest.carroll.edu/` has tons of good multiple choice problems, most of which fit this kind of problem.

In TopHat, there are many different question types that can be used: numeric, fill in the blank for word answers, matching questions. Think about what would fit best!

These can be good at the very beginning of class as a quick warm up. If you do this you can open the question before class starts, and start the timer for 1 minute at the official start of class.

For some simple and/or computational questions, you might want to show the question as an start to finish on the board. (This is particularly true if there are certain steps you are expecting them to show on exams.) If you plan to go this route, it can be good to ***not*** reveal the student answers until the ***end*** of your calculation. This allows for a dramatic reveal and will help you hold the student attention through your solution.

One thing to be avoided: in multiple choice questions, students will sometimes try to use the possible answers as a clue instead of working out the problem honestly from start to finish. (For example: if you ask them to find an anti-derivative, they can skip the hard work by differentiating the possible answers instead.) To avoid this you can show students the question first ***without*** the possible answers, then give them a good chunk of time to work, and only after this reveal the possible MC answers. If you give them a very short timer (e.g. 20 seconds) to select an MC answer, they will have enough time to match the answer they have but not enough time to exploit the possible solutions you gave.

It can also be good to use "None of the above" and "Something else" as possible options to keep students on their toes and prevent them from finding the right answer without doing the work.

3.2 Tricky multiple choice

These questions are designed to push the boundaries of students conceptual understanding. You should expect students to struggle with these; this can be an excellent way for them to learn! The classroom example in the Think-Pair-Share section is an example of this type of question.

Tips

Address student misconceptions directly! Put these in as possible choices. These create really good opportunities to discuss these misconceptions with the students.

It can be good to allow students to express how confident they are in their answer, or allow them to select "I don't know" as an option. This gives you, the instructor, more information about how the students are doing.

You can have students do many True/False questions at once by putting them as options in a MC problem and instructing them to "Select ALL the true statements"

Examples

Caterpillar Function

A caterpillar is crawling around on a piece of graph paper, as shown below.

Is the location of the caterpillar, as measured by its coordinates on the paper, a function of time?

All results

A	Yes, it is a function of time, and I'm very sure	13
B	Yes, it is a function of time, but I'm a bit unsure	23
C	No, it is not a function of time, but I'm a bit unsure	10
D	No, it is not a function of time, and I'm very sure	24
E	I have no idea!	1

What's the connection between min's/max's and derivatives.

Multiple answers: Multiple answers are accepted for this question

Below are some statements about a function f whose domain is all numbers (i.e. there are no endpoints to worry about).
Some of them are TRUE and some of them are common misconceptions which are FALSE
Select ALL the TRUE ones. For the ones that you decide are False, come up with a counterexample
(A counterexample is an example that proves a statement must be false. The statement "If it is a cat, then it must be black" is False. A counterexample to this statement is a white cat)

All results

A	If $f'(a) = 0$ then f has a local min or max at $x = a$	20
B	If f has a local min or max at $x = a$ then $f'(a) = 0$.	30
C	If $f'(a)$ exists and is not equal to 0 then f cannot have a local min or max at $x = a$	112
D	If f' is never equal to zero then f must not have any local mins or maxs.	39

3.3 Argument questions / Find the error

One way to set up a problem asking students to find the error is to set up a conversation between two characters. This prompt to think about arguments critically can be the push some students need to go beyond thinking of math as just recipes.

One variation of this type of problem is to have two characters, let's call them Alice and Bob, discussing a mathematical concept or question together. In these conversations, we want to the students to correctly identify which of the characters is correct, if either.

The general set up would be to pose the argument to the student, with some assortment of the following four options to chose from:

(a) Alice is right, Bob is wrong.

(b) Bob is right, Alice is wrong.

(c) Both are right.

(d) Both are wrong.

Examples

Alice and Bob are working on the derivative of $19e^{4x}$. When they compare answers they realize they both did it differently. Alice says: "I used the 'constant multiple rule', $\frac{d}{dx}(19e^{4x}) = 19\frac{d}{dx}(e^{4x})$". Bob says: "I used the product rule since $19e^{4x}$ is 19 times e^{4x}". Who is right?

(a) Alice is right, Bob is wrong.

(b) Bob is right, Alice is wrong.

(c) Both are right.

(d) Both are wrong.

Alice and Bob are looking at a function $f(x)$ Bob says: "The function is increasing on every interval that contains $x = 3$". Alice says: "Ya, that seems to be true". Bob says: "That means that derivative at $x = 3$ has to be positive; i.e. $f^0(3) > 0$, because increasing means the slope is positive" Alice says: "I don't think that is true! I think it could be that $f^0(3) = 0$". Who is correct here?

(a) Alice is right, Bob is wrong.

(b) Bob is right, Alice is wrong.

(c) Both are wrong.

Another variation of the problem would be to ask students precisely what steps Alice and Bob need to take next. In the next example, Alice and Bob are arguing about whether or not a function has a local maximum. Bob thinks it definitely must, but Alice thinks more properties of f must be checked before reaching a conclusion. Students can choose that either Bob is correct in his approach, or they can choose whether Alice is correct, but there is one caveat: if they believe Alice is correct, they need to choose which properties must be checked. This adds an additional layer of difficulty to the problem.

Alice and Bob are working on a function f.
Alice notices that f is increasing to the left of $x = a$ (i.e. $f(x)$ is increasing on any interval whose endpoints are less than a) and f is decreasing to the right of $x = a$. Bob says: "That means that f must have a local maximum at $x = a$!" Alice says: "Not so fast! I think we might need to check some more properties of f first."
What do they need to do?

(a) They don't need to do anything: They already have enough information to know there is a maximum at $x = a$.

(b) They need to compute the derivative of f; increasing/decreasing is not enough.

(c) They need to compute the second derivative of f to see if its a min or a max.

(d) They need to make sure f is continuous at $x = a$.

You can also simply give the students a (possibly flawed) argument and ask them to evaluate how correct it is. This can be good to make sure students have the correct expectation on what level of detail is required. Students sometimes have a meta-level misconception that stringing together many math-y words constitutes a correct solution, and this type of question helps them realize what exactly they need to do.

Is this solution correct?
Problem: Verify $y(t) = 7t + 2e^t$ is a solution to the initial value problem

$$\begin{cases} (1-t)y'' + ty' = y \\ y(0) = 2 \\ y'(0) = 9 \end{cases}$$

Answer: By rearranging the equation

$$y'' = \frac{1}{1-t}y - \frac{t}{1-t}y',$$

and by doing the derivative twice we see that

$$y''(t) = 0 + 2e^t$$

Therefore $\frac{1}{1-t}y(t) - \frac{t}{1-t}y'(t) = 2e^t$ and so it is indeed a solution to the differential equation.

Student answers:

A	Totally correct	6
B	Mostly correct	40
C	50% correct	20
D	Mostly incorrect	18
E	Totally incorrect	5

3.4 Word answer

TopHat allows for word answers rather than multiple choice or numerical answers. These can be used when you want to lead into a discussion about definitions/concepts rather than calculations.

Tips

Fill in the blank is a really easy way to make good questions.

The word cloud feature on TopHat is great for showing many student responses! It gives you, the instructor, the chance to pick out words that students put in that will lead to interesting discussion.

Try to be specific about answer format. (e.g. put in intstructions like "use one word")

You can run a word answer in the first round of voting, and then write the top four most common choices on the board. In the second round of voting, tell the students to choose one of those four options only. This effectively turns the second round into multiple choice and can help focus the discussion.

Examples

Instantaneous rate of change and tables

On TopHat: Fill in the blank with a word to make the sentence true:
"If you are given a table of values for $f(x)$,
but no other information, you CAN ____________ the
instantaneous rate of change of $f(x)$ at some point $x = c$."
(You may assume that the value of $f(c)$ is given on the table)

On a piece of paper:
: fill in the blanks in this sentence: (use as many words in each blank as you need to make it clear)
"You CAN NOT ____________ the instantaneous
rate of change of f using only a table of values because ________________________"

The top 4 common answers: Find, Not find, Estimate, Calculate. In the second round of voting, these were written on the board and students were told to choose which they thought fit best.

3.5 Discussion questions

TopHat allows the creation of little mini forums where students can post longer format answers. This is an intriguing possibility since we want to encourage deep thinking in our courses, but can lead to students getting off topic and need to be used carefully.

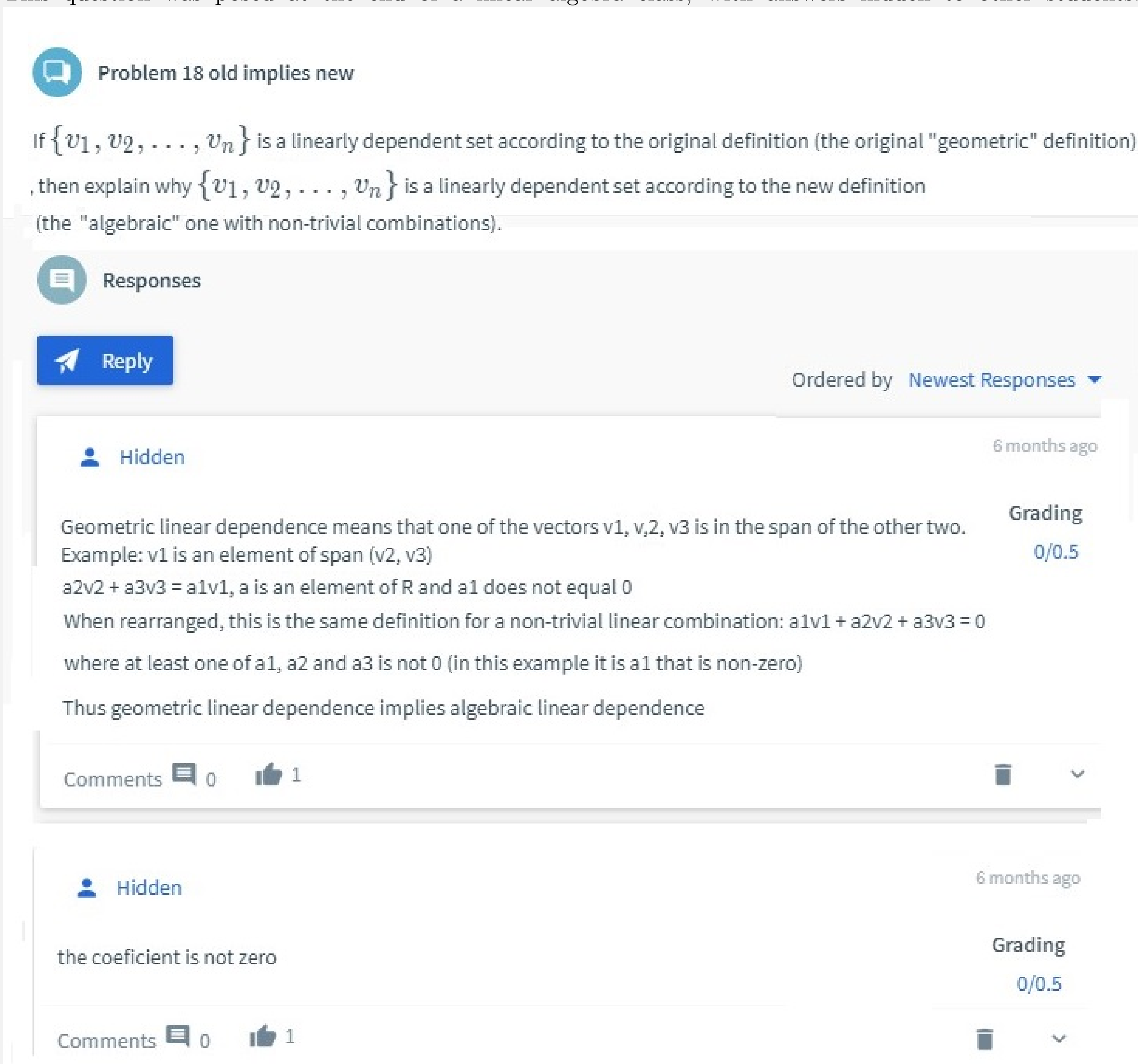
Tips

Its *extremely* easy for these questions to devolve into students making off topic jokes. Be careful!

A good way to keep things on topic is to assign these at the *end* of class and make the responses not publicly visible. Then before your next class, you can go through student answers and highlight some interesting ones at the beginning of the following class.

Examples

This question was posed at the end of a linear algebra class, with answers hidden to other students.



Problem 18 old implies new

If $\{v_1, v_2, \ldots, v_n\}$ is a linearly dependent set according to the original definition (the original "geometric" definition), then explain why $\{v_1, v_2, \ldots, v_n\}$ is a linearly dependent set according to the new definition (the "algebraic" one with non-trivial combinations).

Responses

Reply

Ordered by Newest Responses

Hidden — 6 months ago

Grading 0/0.5

Geometric linear dependence means that one of the vectors v1, v,2, v3 is in the span of the other two.
Example: v1 is an element of span (v2, v3)

a2v2 + a3v3 = a1v1, a is an element of R and a1 does not equal 0

When rearranged, this is the same definition for a non-trivial linear combination: a1v1 + a2v2 + a3v3 = 0

where at least one of a1, a2 and a3 is not 0 (in this example it is a1 that is non-zero)

Thus geometric linear dependence implies algebraic linear dependence

Comments 0 1

Hidden — 6 months ago

Grading 0/0.5

the coeficient is not zero

Comments 0 1

In the following class, I chose a few students answers worth discussion and turned them into a multiple choice question. (There were many low-effort answers and jokes that I ignored)

Which of these explanations do you think is completely correct? Select ALL that apply

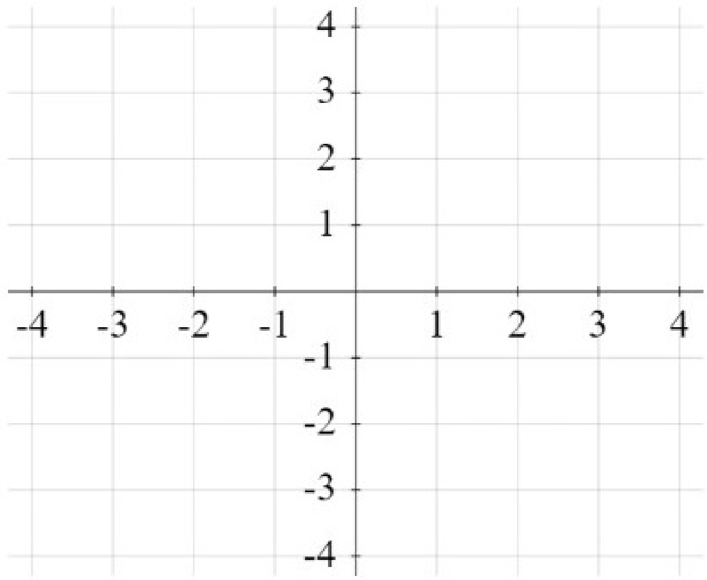
All results ▾

A	Since there is a vi which is in the span of the other vectors, if we subtract vi from the linear combination of the other vectors that forms v_i, then we get a non-trivial linear combination for the zero vector.
B	You can express a vector vi in the given set as a linear combination of all other vectors in the set. Then if you bring vi to the right side of the equation, you get a linear combination for the zero vector with v_i having a coefficient of -1, meaning the combination is non trivial.
C	Knowing that there exists a vector, v, in the span of the others means that there exists a linear combination of the other vectors such that it equals vector v. This is essentially the same as the algebraic interpretation, when the definition of span is applied to the geometric form.
D	Take the linear combination forming the "removed" vector and add the back the removed vector with coefficient one.

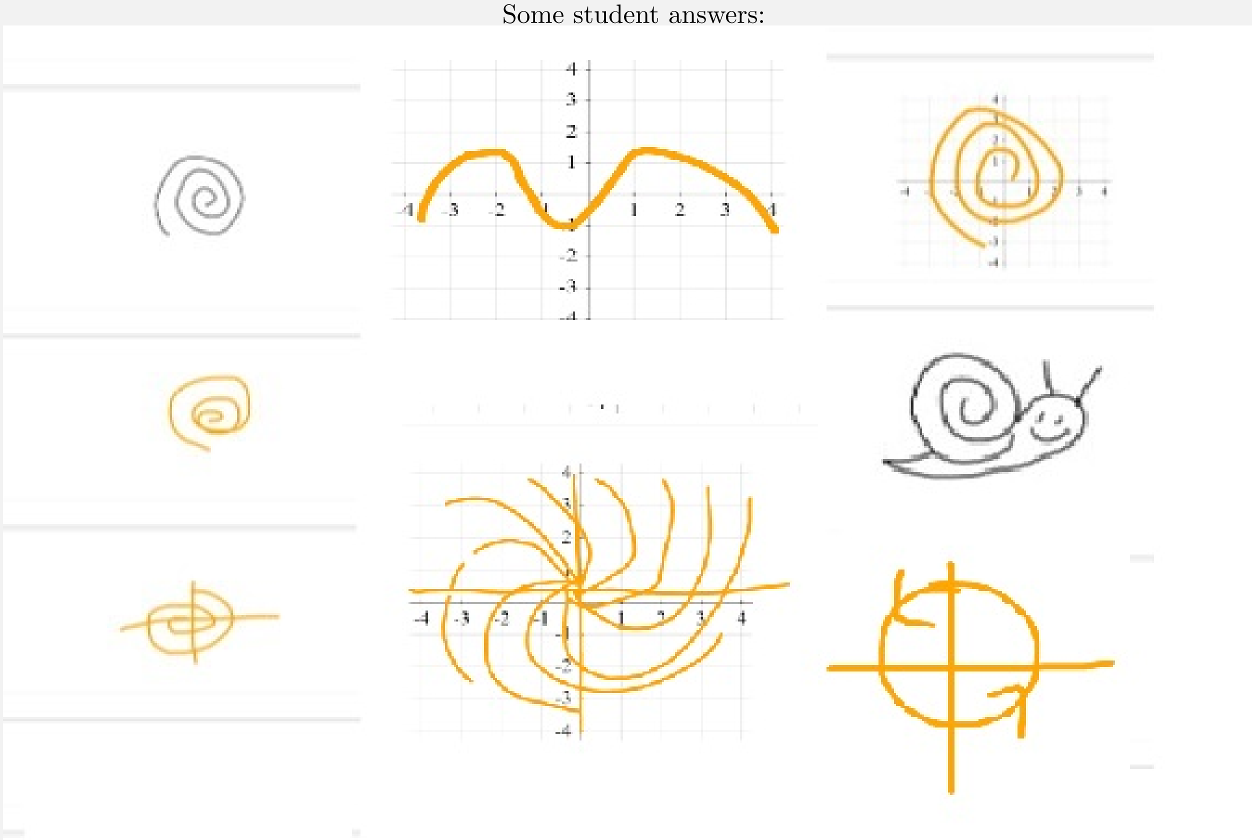
Discussion questions also allow drawings to be submitted (Warning: this can lead to off topic drawings by the students.)

Draw the phase portrait $f'' = -w^2 f$

Based on what you know about simple harmonic motion, and what you know about the vector form for the equation, draw a guess of what you think a solution curve to the differential equation looks like on the phase plane.



Some student answers:



3.6 Click on Targets

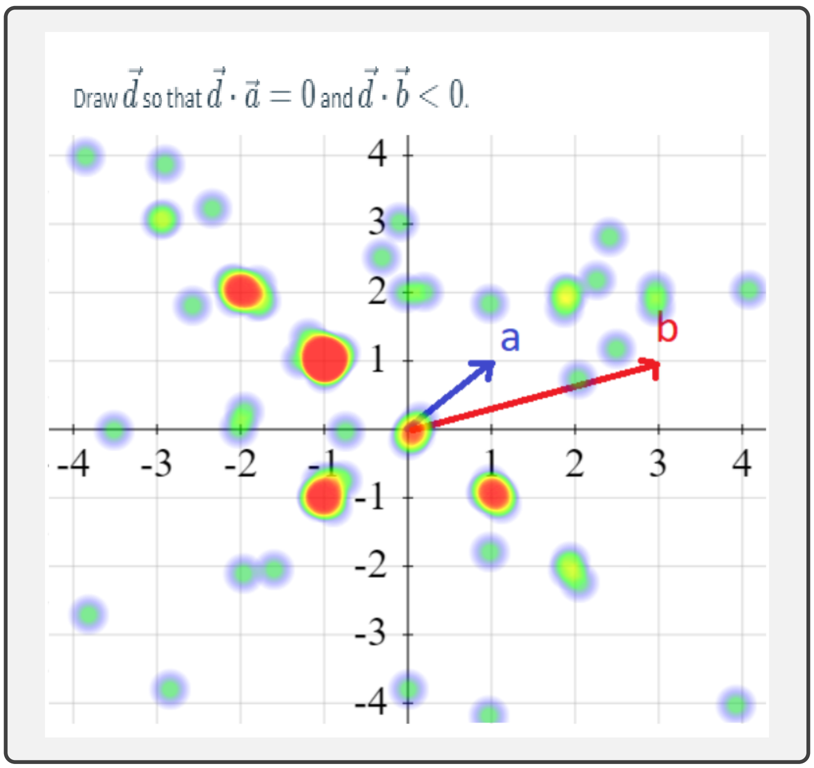
TopHat allows for a type of question called a "click on target" question. In this question, students are shown an image and asked to click on part of it. The computer shows a heat map of where students clicked.

Tips

It can get unruly if you want them to click on many points, so its usually better to try to design the question so each student clicks on one thing. You can sometimes arrange it so the answers from the class will form a patter (see example)

Some students will be using SMS to respond and these students won't be able to use click on target questions; check in with them about this.

Examples



4 Timers and Attention

Sometimes you will find yourself taking too much time with questions and not getting as far as you wanted to in a class. One way to keep on track is to use timers with every question. TopHat has these built in, and also has a "Add 15 seconds to timer" button you can press in class. Usually what works well is:

Always use 1 minute as the default.

If you want to give more time, hit the +15 second button until you get where you want.

When there are 30 seconds left, if many students have answered yet, prompt them "Hands up if you think you need more time". Its ok if a few people feel they need more time but most people don't. If a majority of students need more time, you can hit the +15 seconds button to give them more time.

When there are 10 seconds left, you should remind students "There are about 10 seconds left, take your best guess". Remember, there is usually another round of voting coming soon so this is ok.

Develop the habit that when the timer runs out, students should stop talking and pay attention to you. If you do this consistently this will help you manage student attention.

Another way to prompt students to pay attention to you is to use the classroom lights. If you develop the habit of turning off the board lights while students are working (so they can see the projected questions more clearly), and then turning the lights back on when you want students to pay attention to you, this is a very clear visually cue.

5 Participation vs Correctness

For the problem template on TopHat, one can choose participation and correctness points. It is easiest if instructors determine before the semester begins how the problems will be graded.

5.1 Participation only

In Fall 2018, the most common grading chosen by instructors at U of T for MAT135 for TopHat questions was 100% participation and 0% for correctness.

Upside: Students are less concerned if their answer is correct and their grade.

Upside: Provides a sense of freedom for the students to attempt the problem on their own and risk getting an incorrect answer.

Upside: Less issues for the instructor regarding grading the problem (especially if there was an error in the correct answer or if no correct answer was provided).

Downside: Instructors have noticed that toward the end of the semester, students are not attempting the problem and input erroneous answers into TopHat.

Downside: Students in general may not be as serious in solving the problem if their grade is not affected.

5.2 Correctness and Participation

One can update the problem template to automatically give 50% of the grade for correctness and 50% for participation (or any combination thereof). If there was a particularly challenging question, one can change the percentage after class to 0% for correctness and 100% for participation.

Upside: Students are encouraged to speak with their neighbors, discuss their possible answers, and input the one they believe is correct.

Upside: There is more excitement in the classroom when the correct answer is chosen.

Upside: Students seem to take the problems more seriously when their grade is affected.

Downside: The students may be only relying on who they deem to be stronger students for their answers and not understanding the problem on their own.

Downside: The grading can be painful if there are errors in the TopHat question or answer. The instructor can go back and change the question to 100% participation, but it is more work.

Using correctness and participation, at the end of the semester the instructor noted that due to the curve of the Tophat grades, the correctness factor did not affect most students. For those that did not receive the curve, one can use their participation scores only.

6 Technical Tips

Here are some assorted technical problems we encountered and their solutions.

6.1 LaTeX

In TopHat, to include a math formula or equations, you are able to input your LaTeXcode in math wrap brackets. The steps to do this are as follows:

1. Begin by typing [math] to indicate to TopHat that what's to follow will be written using LaTeX
2. Type in your LaTeXformula, for example A = *n*frac *f* 1 *gf* 2 *g* *n*theta r ˆ2
3. End by typing [/math] to indicate the end of your LaTeX
4. The final equation you will have typed will be [math] A = *n*frac *f* 1 *gf* 2 *g* *n*theta r ˆ2 [/math] and will produce $A = \frac{1}{2}\theta r^2$.

Images in place of LaTeX

If using LaTeXto write out your problem, take caution that there are times where the code will not compile properly when presenting the problems to your class. One way to avoid this issue is to attach an image of the question with the LaTeXcode already compiled in your native compiler. To do this, select a question you wish to edit on TopHat. At the bottom right of the "Question" prompt, you will see the blue words "Attach Image". Click on this and attach the image of the problem you wish to present. Currently, there is no option to attach images as an answer to multiple choice, matching, or sorting. Therefore, if you would like to include a typeset answer you need to input the LaTeXcode for the answers, as described above, or include options A,B,C,D as part of your compiled latex.

Screenshots from the textbook or other sources you find online can also help you construct good questions quickly. (Be careful with copywrited content)

TopHat Inline Symbol Selector

If you only wish to include one symbol, it is also possible to use the Inline Symbol Selector which is built into TopHat. To access the Inline Symbol Selector, place your cursor where you would like to place the symbol, and a small blue + icon will appear. When you click on this icon, you will reveal the symbol selector menu where you can select the symbol you would like to insert. The advantage to using the Inline Symbol Selector is that these symbols don't need to compile so you won't run into the issue that the question will not compile properly.

Commas in TopHat

TopHat will sometimes not allow you to put commas in some multiple choice questions. This is extremly annoying. The workaround for this is to use the Unicode "Single low-9 quotation mark" instead of a comma from `https://www.fileformat.info/info/unicode/char/201a/index.htm`. This looks identical to a comma but TopHat won't complain. You should copy the character from that webpage and paste it in where you need commas.

6.2 Embedding Hyperlinks

It is possible to embed hyperlinks in TopHat questions or discussions if you would like your students to be able to access content from another website. The steps to include a hyperlink are as follows:

1. Type the phrase you would want hyperlinked and wrap it in square brackets, ex. [TopHat]
2. Immediately following this, type or paste the link itself wrapped in round brackets ex. (www.tophat.com)

Therefore, to link the site www.tophat.com to the phrase *TopHat* you would write [TopHat](www.tophat.com)

When you activate the question, the hyperlinked phrase will appear in blue to indicate to the students that it is linked to an external site, and by clicking on the phrase they will be taken to the linked external website. To return to the Top Hat course, either click the tab on your browser, or open up the application on your mobile device.

6.3 Classroom Setup

Before using TopHat in your classroom, it is important to visit your classroom to see the room setup. If you have the blackboards and projectors arranged separately, it is possible to use TopHat and your black boards at the same time. However, to save space, many classrooms have that their projector will cover their blackboards when in use. If you have a room with this layout, there are a few options available so that you do not need to wait for the projector to set up each time you would like to use TopHat.

Document Camera

The first solution is to use a document camera. At the University of Toronto, document cameras are set up using the classroom podium. Since the projector is also able to be accessed using the podium, you will be able to switch back and forth between the document camera and TopHat using the podium. When you switch to the TopHat program, be advised that the students will no longer be able to see the material on the document camera. If you would like to use a document camera, you will need to book a document camera for each of your classes. If you would like to use a document camera but aren't sure how to use one, we recommend booking your assigned room with the document camera before your first class. Often someone from IT will be there who can explain the basics of how to use the document camera, and if not, you can contact IT using the class podium to have someone arrive to teach you the basics.

Tablet

Another option would be to use a tablet in class. This will allow for a quick transition between TopHat and the program of your choice to write lecture notes. If you have a tablet which allows you to split the screen, you will be able to project both TopHat and the class notes at the same time. Before doing this, either check that splitting the screen will not shrink what is being displayed or visit your classroom to be ensure that the students in the back will still be able to see what is being projected. Additionally, check that you have all of the required cables to connect your tablet to the classroom projectors before the first day of class.