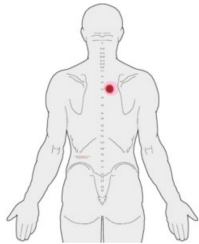
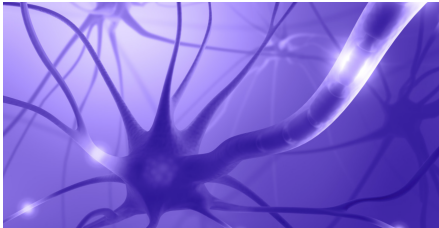


# Mathematics In Pain

Mohamed Omar

Harvey Mudd College

MAA SoCal/Nevada Sectional Meeting  
April 29, 2017



There is a personal struggle at the forefront of our minds  
above everything else.

# Teaching Differently

I need to teach but it hurts to:

- Write on paper
- Type on keyboards
- Write on chalkboards or whiteboards

Response:



# Teaching Differently

I need to teach but it hurts to:

- Write on paper
- Type on keyboards
- Write on chalkboards or whiteboards

Response: **AAAAHHH!!!!**

# Teaching Differently: Handouts

Last Time:

The number of ways to select  $k$ -elements from an  $n$ -element set is:

	order matters	order doesn't matter
the $k$ elements are distinct	1	3
the $k$ elements are not necessarily distinct	2	4

Today: We will fill in box \_\_\_\_.

# Teaching Differently: Handouts

Last Time:

	order matters	order doesn't matter
the $k$ elements are distinct	$\frac{n!}{(n-k)!}$	$\binom{n}{k} = \frac{n!}{k!(n-k)!}$
the $k$ elements are <u>not</u> distinct necessarilly	$n^k$	$\binom{n+k-1}{n-1}$

# Teaching Differently: Handouts

**Example.** Suppose random variables  $X, Y$  having joint distribution given by

$$f_{X,Y}(x,y) = \frac{1}{162}xy^2, \quad 0 \leq x \leq 6, \quad 0 \leq y \leq 3.$$

Are  $X, Y$  independent?

# Teaching Differently: Handouts

**Example.** Suppose random variables  $X, Y$  having joint distribution given by

$$f_{X,Y}(x,y) = \frac{1}{162}xy^2, \quad 0 \leq x \leq 6, \quad 0 \leq y \leq 3.$$

Are  $X, Y$  independent?

$$f_X(x) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dy = \int_0^3 \frac{1}{162} \cdot xy^2 dy = \int_0^3 \frac{1}{162} \cdot x \cdot \frac{y^3}{3} dy = \frac{x}{18}.$$

$$f_Y(y) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dx = \int_0^6 \frac{1}{162} \cdot xy^2 dx = \int_0^6 \frac{1}{162} \cdot \frac{x^2}{2} \cdot y^2 dx = \frac{y^2}{9}.$$

$$f_X(x) \cdot f_Y(y) = \frac{x}{18} \cdot \frac{y^2}{9} = \frac{1}{162}xy^2 = f_{X,Y}(x,y).$$

So they are independent.

# Teaching Differently: Handouts

**Example.** Suppose random variables  $X, Y$  having joint distribution given by

$$f_{X,Y}(x,y) = \frac{1}{162}xy^2, \quad 0 \leq x \leq 6, \quad 0 \leq y \leq 3.$$

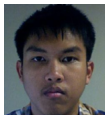
Are  $X, Y$  independent?

$$f_X(x) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dy = \int_0^3 \frac{1}{162} \cdot xy^2 dy = \int_0^3 \frac{1}{162} \cdot x \cdot \frac{y^3}{3} = \frac{x}{18}.$$

$$f_Y(y) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dx = \int_0^6 \frac{1}{162} \cdot xy^2 dx = \int_0^6 \frac{1}{162} \cdot \frac{x^2}{2} \cdot y^2 = \frac{y^2}{9}.$$

$$f_X(x) \cdot f_Y(y) = \frac{x}{18} \cdot \frac{y^2}{9} = \frac{1}{162}xy^2 = f_{X,Y}(x,y).$$

So they are independent.

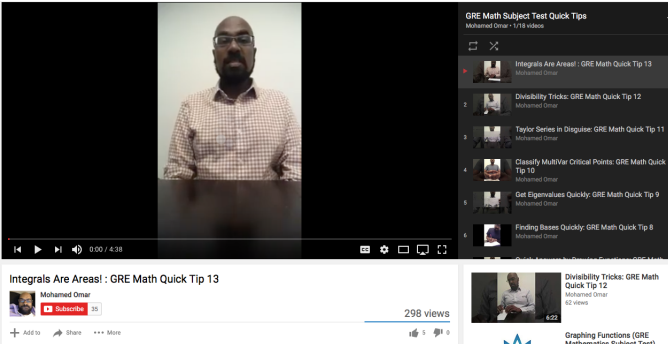


## Teaching Differently: Videos



Prof. Candice Price, University of San Diego

# Teaching Differently: Videos



The screenshot shows a YouTube video player interface. The main video area displays a man with a beard and glasses, wearing a checkered shirt, speaking. Below the video is a progress bar at 0:00 / 4:38. The video title is "Integrals Are Areas! : GRE Math Quick Tip 13" by Mohamed Omar, with 298 views. To the right, a playlist titled "GRE Math Subject Test Quick Tips" lists several videos, including "Integrals Are Areas! : GRE Math Quick Tip 13", "Divisibility Tricks: GRE Math Quick Tip 12", "Taylor Series in Disguise: GRE Math Quick Tip 11", "Classify MultiVar Critical Points: GRE Math Quick Tip 10", "Get Eigenvalues Quickly: GRE Math Quick Tip 9", and "Finding Bases Quickly: GRE Math Quick Tip 8". Below the playlist, a video thumbnail for "Divisibility Tricks: GRE Math Quick Tip 12" is visible, showing a man writing on a whiteboard. The video player controls at the bottom include a play button, a share icon, and a search icon.

Integrals Are Areas! : GRE Math Quick Tip 13

Mohamed Omar

Subscribe 35

298 views

GRE Math Subject Test Quick Tips

Mohamed Omar • 1/18 videos

1 Integrals Are Areas! : GRE Math Quick Tip 13 Mohamed Omar

2 Divisibility Tricks: GRE Math Quick Tip 12 Mohamed Omar

3 Taylor Series in Disguise: GRE Math Quick Tip 11 Mohamed Omar

4 Classify MultiVar Critical Points: GRE Math Quick Tip 10 Mohamed Omar

5 Get Eigenvalues Quickly: GRE Math Quick Tip 9 Mohamed Omar

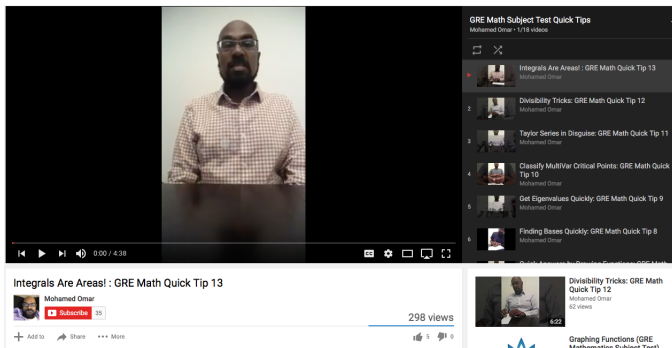
6 Finding Bases Quickly: GRE Math Quick Tip 8 Mohamed Omar

Divisibility Tricks: GRE Math Quick Tip 12 Mohamed Omar 6:22 82 views

Graphing Functions (GRE Mathematics Subject Test)



# Teaching Differently: Videos



The screenshot shows a YouTube video player interface. The main video is titled "Integrals Are Areas! : GRE Math Quick Tip 13" by Mohamed Omar. The video is 4:38 long and has 298 views. The player includes a progress bar and a list of related videos on the right. The related videos are:

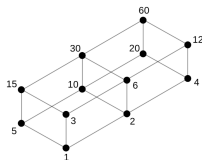
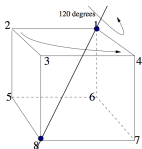
- 1. Integrals Are Areas! : GRE Math Quick Tip 13 (Mohamed Omar)
- 2. Divisibility Tricks: GRE Math Quick Tip 12 (Mohamed Omar)
- 3. Taylor Series In Disguise: GRE Math Quick Tip 11 (Mohamed Omar)
- 4. Classify MultiVar Critical Points: GRE Math Quick Tip 10 (Mohamed Omar)
- 5. Get Eigenvalues Quickly: GRE Math Quick Tip 9 (Mohamed Omar)
- 6. Finding Bases Quickly: GRE Math Quick Tip 8 (Mohamed Omar)

Below the video player, there is a section for the video's details, including the title, channel name, and a subscribe button. The video has 298 views and a like/dislike button.

Google: "Mohamed Omar Math GRE"

# Math 106

## Combinatorics - Math 106



- Terminal course: mostly juniors
- Has proof-based course as a prerequisite
- Math and computer science majors

# Teaching Differently: Student Experience



Gail Tang, University of La Verne

CCMS Colloquium: “The Creativity Rubric”

# Rubric

## Creativity in Progress Rubric (CPR) on Proving

Milos Savic  
University of Oklahoma  
savic@ou.edu

Gulden Karakok  
University of Northern Colorado  
gulden.karakok@unco.edu

Gail Tang  
University of La Verne  
gtang@laverne.edu

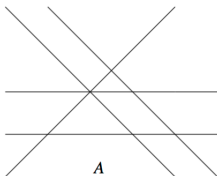
Houssein El Turkey  
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emilie.naccarato@unco.edu

David Plaxco  
University of Oklahoma  
dplaxco@math.ou.edu

<b>MAKING CONNECTIONS:</b>	<b>Beginning</b>	<b>Developing</b>	<b>Advancing</b>
Between Definitions/Theorems	Recognizes some relevant definitions/theorems from the course or textbook with no attempts to connect them in their proving	Recognizes some relevant definitions/theorems from the course and attempts to connect them in their proving	Implements relevant definitions/theorems from the course and/or other resources outside the course in their proving
Between Representations <sup>1</sup>	Provides a representation with no attempts to connect it to another representation	Provides multiple representations and recognizes connections between representations	Provides multiple representations and uses connections between different representations
Between Examples	Generates one or two specific examples with no attempt to connect them	Generates one or two specific examples and recognizes a connection between them	Generates several specific examples and uses the key idea synthesized from their generation

# Portfolio Problem



Determine the number of bounded and unbounded regions of a  $\mathcal{A}$ -arrangement in terms of its intersection poset in as many of the following situations as you like:

1.  $\mathcal{A}$  consists of  $V$ 's in the plane; 3-space.
2.  $\mathcal{A}$  consists of circles, no pair of which are tangent.
3. other geometric objects (example, varieties)

# Collaborators



Gail Tang



Emili Cilli-Turner



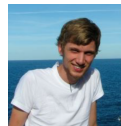
Milos Savic



Houssein El-Turkey



Gulden Karakok



David Plaxco

STRUGGLE: GET HELP!

# High School



- Navigate college application process
- Funded college through scholarships



# College



- Missed classes
- Didn't attend office hours
- Didn't Ask For Help

# College



- 4 graduate classes and elective
- Father had cancer
- Didn't Ask For Help

# The Bad Term



- Grades sacrificed
- GRE Subject Test Score

# The Bad Term



- Grades sacrificed
- GRE Subject Test Score
- Not accepted to **any** of the 9 graduate programs I applied to

# Teaching Differently

I need to teach but it hurts to:

- Write on paper
- Type on keyboards
- Write on chalkboards or whiteboards

Response: **AAAAHHH!!!!**

# Teaching Differently

I need to teach but it hurts to:

- Write on paper
- Type on keyboards
- Write on chalkboards or whiteboards

Response: **AAAAHHH!!!!** I NEED HELP!!!!

# Help Please!



Dean Groves

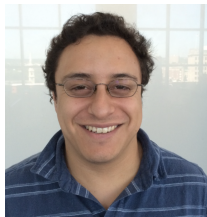


Prof. dePillis

# Help Please!



Nora Youngs



Ivan Ventura



# MORE Help Please!



Dean Groves



Prof. dePillis

# Dragon!



There is a personal struggle at the forefront of our minds  
above everything else.

Thanks!