

High School Math Pathways Symposium

Algebra 2 Course Updates



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5. Algebra 2 Course Updates

Facilitated by

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This session will be recorded, so it can be posted on the Department's website. The recording will begin at the end of this slide.

Give feedback on
our Padlet!



Algebra 2 Refocused

Goal: To get more students to understand and pass Calculus at the collegiate level.

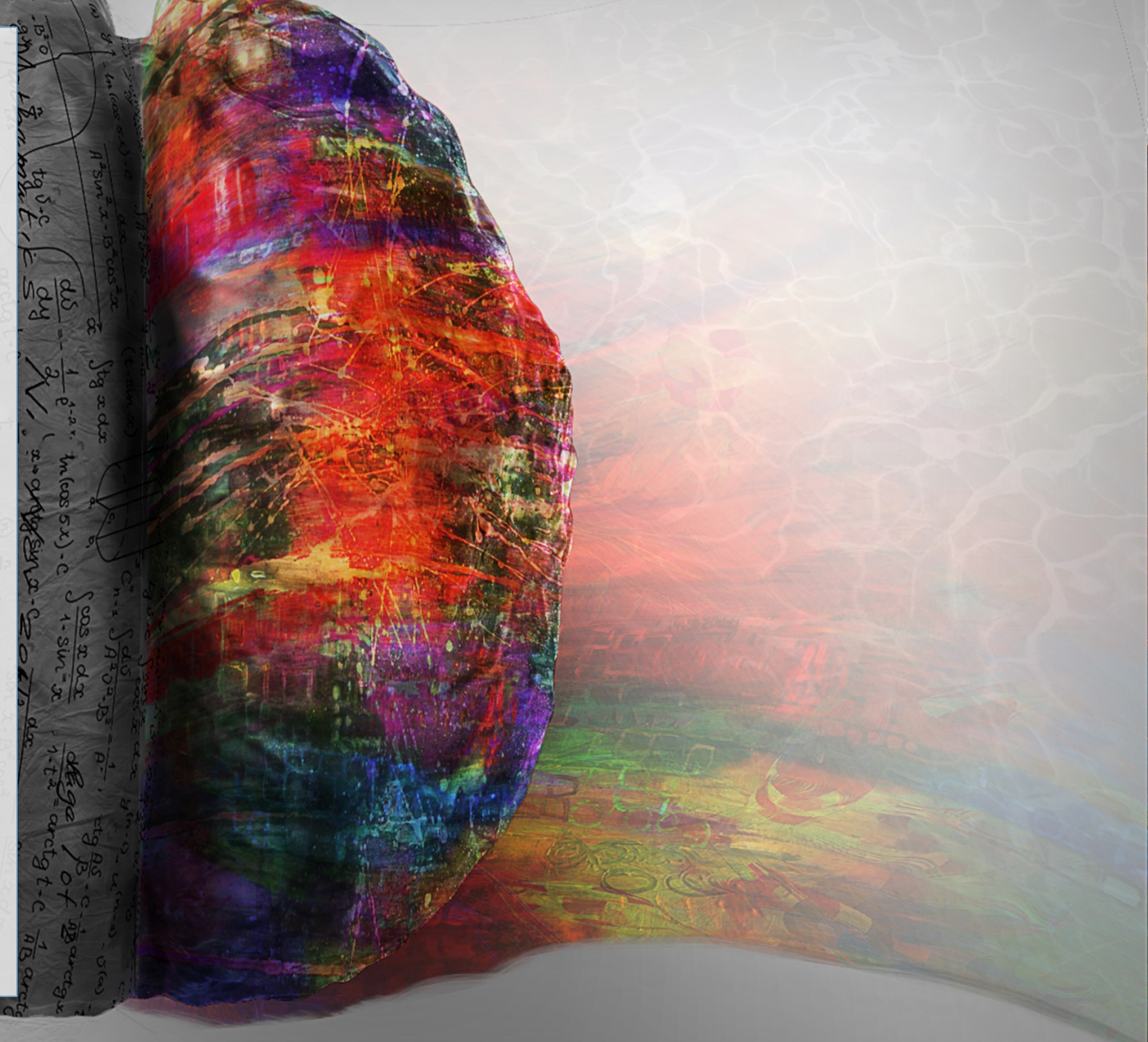
College-level Calculus is just the *beginning* of mathematics for most STEM students on the Calculus Pathway.



It is no longer Algebra 2 for all!

Rigor

“Students use mathematical language to communicate effectively and to describe their work with clarity and precision. Students demonstrate how, when, and why their procedure works and why it is appropriate. Students can answer the question, ‘How do we know?’”



Rigorous courses are...

Defined by complexity, which is a measure of the thinking, action or knowledge that is needed to complete the task

Measured in depth of understanding

Opportunities for precision in reasoning, language, definitions and notation that are sufficient to appropriate age/course

Determined by students' process

Opportunities for students to make decisions in problem solving

Rigorous courses are not...

Characterized by difficulty, which is a measure of effort required to complete a task

Measured by the amount of work

Based on procedure alone

Measured by assigning difficult problems

Defined only by the resources used

Rigorous courses are...	Rigorous courses are not...
Opportunities to make connections	Taught in isolation
Supportive of the transfer of knowledge to new situations	Repetitive
Driven by students developing efficient explanations of solutions and why they work, providing opportunities for thinking and reasoning about contextual problems and situations	Focused on getting an answer
Defined by what the student does with what you give them	Defined by what you give the student



Higher Education Expectations

- Algebraic Reasoning
- Analytic Reasoning
- Communication
- Independence

Critical Areas of Focus



Communication and Analysis

Modeling with Functions

Extending Algebraic Reasoning

Polynomial and Rational Relationships

Trigonometry of General Triangles

Changes to Algebra 2 Standards Course Guidance Document

Number and Quantity

STANDARDS ADDED

Perform arithmetic operations with complex numbers.

N.CN.3 Find the conjugate of a complex number; use conjugates to find magnitudes and quotients of complex numbers.

PLUS (+) SIGNS REMOVED

Use complex numbers in polynomial identities and equations.

N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.

N.CN.8 Extend polynomial identities to the complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.*

N.CN.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Changes to Algebra 2 Standards Course Guidance Document

Algebra

STANDARDS DELETED

Use polynomial identities to solve problems.

A.APR.4 Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*

PLUS (+) SIGNS REMOVED

Rewrite rational expressions.

A.APR.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Changes to Algebra 2 Standards Course Guidance Document

Functions

STANDARDS ADDED

Build a function that models a relationship between two quantities.

F.BF.1 Write a function that describes a relationship between two quantities.★

c. Compose functions. *For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. (A2, M3).*

STANDARDS DELETED

- All F.TF Standards

Changes to Algebra 2 Standards Course Guidance Document

Functions

PLUS (+) SIGNS REMOVED

Analyze functions using different representations.

F.IF.7 Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.★

g. Graph rational functions, identifying zeros and asymptotes when factoring is reasonable, and indicating end behavior. (A2, M3)

h. Graph logarithmic functions, indicating intercepts and end behavior. (A2, M3)

Build new functions from existing functions.

F.BF.4 Find inverse functions.

b. Read values of an inverse function from a graph or a table, given that the function has an inverse. (A2, M3)

c. Verify by composition that one function is the inverse of another. (A2, M3)

d. Find the inverse of a function algebraically, given that the function has an inverse. (A2, M3)

Changes to Algebra 2 Standards Course Guidance Document

Geometry

STANDARDS DELETED

Find arc lengths and areas of sectors of circles.

G.C.6 Derive formulas that relate degrees and radians, and convert between the two. (A2, M3)

Changes to Algebra 2 Standards Course Guidance Document

Geometry

PLUS (+) SIGNS REMOVED

Define trigonometric ratios, and solve problems involving right triangles.

G.SRT.8 Solve problems involving right triangles.★

b. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★ (A2, M3)

Note: Standard G.SRT.10 Part a. is included in this course to be considered for next standards revision.

Apply trigonometry to general triangles.

G.SRT.9 Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

G.SRT.10 Explain proofs of the Laws of Sines and Cosines and use the Laws to solve problems.

a. *Extend right triangle trigonometry to include obtuse angles.*

G.SRT.11 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles, e.g., surveying problems, resultant forces.

Changes to Algebra 2 Standards Course Guidance Document

Statistics and Probability

STANDARDS DELETED

All Statistics and Probability standards except:

Summarize, represent, and interpret data on two categorical and quantitative variables.

S.ID.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions, or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* (A2, M3)
- b. Informally assess the fit of a function by discussing residuals. (A2, M3)

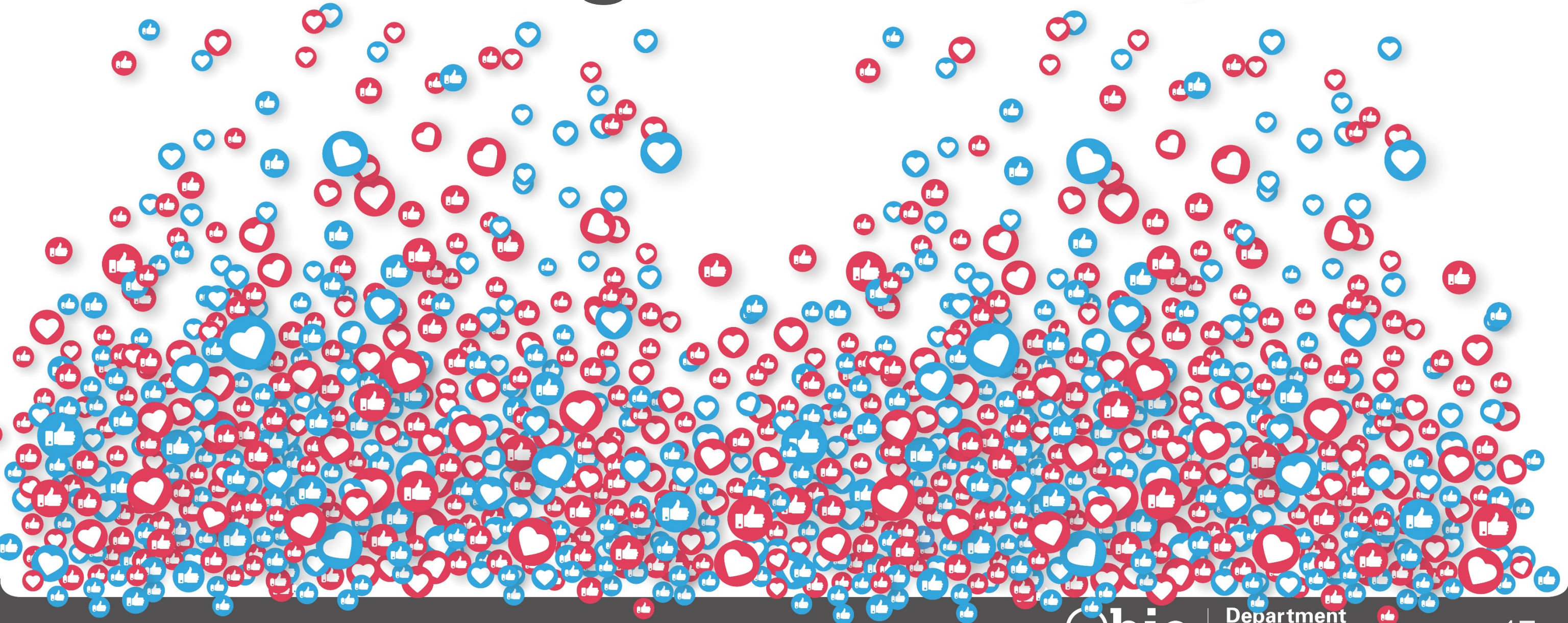
Follow-on Courses

- Pre-Calculus at the high school
- CCP Trigonometry
- Other Algebra 2 equivalency course
- Other CCP math course
- Possibly AP Statistics

Note: CCP College Algebra is not a beneficial course for most students on the calculus pathway. It would be better for most students on the calculus pathway to take a pre-calculus course at their own high school with the intention of taking an AP Calculus course or Calculus in a postsecondary setting.



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