



KENTUCKY CENTER
FOR MATHEMATICS

Let's Do Math with KCM High School Algebra II

Function Simulations

Welcome!

Your host

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Kentucky Center for Mathematics

- KCM seeks to advance the knowledge and practice of effective mathematics teaching and learning, encompassing early childhood through adult education.
- KCM provides and develops statewide leadership, facilitate professional learning experiences, and cultivate innovation with the aim of improving mathematics education, practice and policy.

KCM Yearly Numbers

29 math courses taught

73 cohorts of teachers

Over 1000 KY teachers
attending

Over 182 days of
math professional learning

Over \$150,000 of math
materials directly in the hands
of teachers

109 school districts

300 KY schools

100 principals trained

>5000 students impacted

KCM Annual Math Conference
national prominence

Closing the achievement gap
for our KY math students.

Math Achievement Fund
intervention students (3000)
had an average of 10 percentile
points gained as a direct result
of KCM trained math
interventionists.

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Today's Session

- Research
- Standard
- Let's Do the Math Rich Tasks Exploring Transformations of Functions
- Phet Simulations: Function Basics, Graphing Lines, Graphing Quadratics
- Conclusions and Generalizations
- Virtual Manipulatives

Research

Effective Mathematics Teaching Practices

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.



National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

Kebritchi, Hirumi, and Bai (2010) found **computer mathematics games** to have a positive significant effect on high school students' motivation and achievement in mathematics class.

Kebritchi, M., Hirumi, A., & Bai, H. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. *Computers & education*, 55(2), 427-443.

Standards

KY.HS.F.8 Understand the effects of transformations on the graph of a function. MP.3, MP.5

- a. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$ and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs.
- b. Experiment with cases and illustrate an explanation of the effects on the graph using technology.

Let's Do the Math...

Task: Exploring Transformation of Functions

Consider the function

$$f(x) = x^5 + 2x^4 - 7x^3 - 8x^2 + 12x$$

How do the graphs of each of these modified versions of the function $f(x)$ compare with the original?

$$f(x) + c$$

$$f(x + c)$$

$$f(cx)$$

$$c \cdot f(x)$$

Function Simulations

Function Basics

How do the graphs of modified versions of *any function* compare with the original?

Graphing Lines

$$h(x) = mx + b$$

$$h(x) + c$$

$$h(x + c)$$

$$h(cx)$$

$$c \cdot h(x)$$

Graphing Quadratics

$$g(x) = ax^2 + bx + c$$

$$g(x) + c$$

$$g(x + c)$$

$$g(cx)$$

$$c \cdot g(x)$$

Conclusion & Generalizations

What can you conclude about their relationships to the graphs ?

Is this true all functions?

What other digital representations of parabolas may we consider?



Fig. 1 The parabolic trajectory of the Angry Bird is highlighted during the launch.

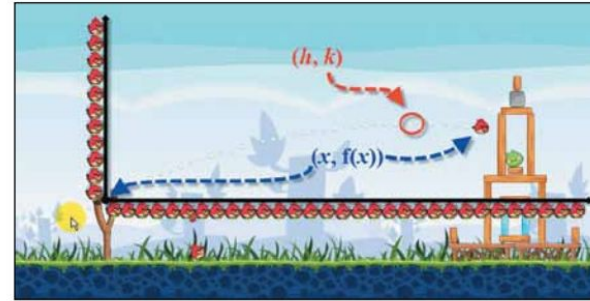


Fig. 2 The diameter of an Angry Bird is the unit of measure on both axes.

Virtual Manipulatives

[Geogebra](#)

[Phet Interactive Simulations](#)

[Desmos](#)

[Didax Math Virtual Manipulatives](#)

GeoGebra



KCM Support for Educators

Your host

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Apr 16

1:00-1:30 p.m. EDT

Statistics & Probability with Virtual Manipulatives

Facilitated by: Leah Dix

Downloads: TBD

