**Intermediate Algebra Sabbatical Project 2016**

**Resources Organized by Instructional Unit**

**Open Source Textbooks**

[Boundless](http://www.boundless.com)

[College Open Textbooks](http://www.collegeopentextbooks.org)

[Flat World](http://catalog.flatworldknowledge.com/catalog/disciplines/5/titles)

[Flexbooks](http://www.ck12.org)

[MyOpenMath](http://www.myopenmath.com)

[Openstax](http://www.openstaxcollege.org)

[Open Textbook Library](http://open.umn.edu/opentextbooks/SearchResults.aspx?subjectAreald=7)

[OpenTextbookStore](http://www.opentextbookstore.com)

[Stitz-Zeager (College Algebra and above)](http://www.stitz-zeager.com)

Also, you can mash together texts like [WTAMU's Intermediate Algebra](https://www.mail.commnet.edu/owa/redir.aspx?C=7ydjsJPU7Ue99pUMMsVs9DU5C4MPSdMIYYEWzqvVu7I7finM5SEjjV6Uc14BWRm2d1tc6bJmPFI.&URL=http%3a%2f%2fwww.wtamu.edu%2facademic%2fanns%2fmps%2fmath%2fmathlab%2fint_algebra%2findex.htm), but those won't give you a "printable" textbook.

**Functions and Linear Functions**

**AMATYC The Right Stuff: Appropriate Mathematics for all students**

* 18.0 Archimedes’ Law: Linear functions, algebra, and table of values (select 18 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 5.0 Soap Bubbles, Cheesecake Factories, and Cell Phone Towers : Linear Functions (select 5 at top)

<http://therightstuff.matyc.org/RSmods2009/index.html>

* 7.0 A Slice of Liver: Linear functions (select 7 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 16.0 Compound Interest: Linear Functions (select 16 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 2.0 Generator Math: Linear modeling (select 2 at top) http://therightstuff.matyc.org/RSmods2009/index.html

**Connecticut Core Standards Algebra I Curriculum:**

Unit 3 - Functions:

* [Activity 3.1.1a Representing Relations I](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a311a_represent_relations1.docx)
* [Activity 3.1.1b Representing Relations II](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a311b_represent_relations2.docx)
* [Activity 3.1.2 Is it a Function](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i1_a312_is_it_a_function.docx)
* [Activity 3.2.3 Functions Everywhere](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i2_a323_functions_everywhere.docx)
* [Activity 3.2.5 The Raven and the Jug](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i2_a325_raven_jug.docx) (experiment to collect linear data)
* [Activity 3.3.1 Function Machines](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i3_a331_function_machines.docx)
* [Activity 3.3.4 Hot Air Balloon](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i3_a334_hot_air_balloon.docx) (domain, range, and function values from a graph)
* [Activity 3.4.6 Phone Tree](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_a346_phone_tree.doc)
* [Activity 3.4.7 Handshakes](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_a347_handshakes.docx)
* [Parent Function Reference](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u3_i4_function_reference.pdf)

Unit 4 – Linear Functions:

* [Activity 4.2.4 Draining a Swimming Pool](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i2_a424_draining_a_pool.docx)
* [Activity 4.4.5 Applications of Slope-Intercept Form](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i4_a445_slope-Inter_form_applied.docx)
* [Activity 4.6.6 Finding and Using Linear Functions](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i6_a466_finding_linear_functions.docx)
* [Activity 4.6.7 You Choose](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u4_i6_a467_you_choose.docx) (finding linear functions to model given situations)

Unit 5 – Scatter Plots and Trend Lines:

* [Activity 5.2.1 Sea Level Rise](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i2_a521_sea_level.docx)
  + [Presentation](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i2_presentation_sea_level_rise.pdf)
* [Activity 5.2.2 Scatter Plots and Trend Lines](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i2_a522_scatter_plots_trend.docx)
* [Activity 5.2.3 TV Watching, Homework and Test Scores](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i2_a523_tv_watch_hmwk_test_scores.docx)
* [Activity 5.2.4 Height and Shoe Size](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i2_a524_height_shoe_size.docx)
* [Activity 5.3.1 Fitting Lines with Technology](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i3_a531_fitting_lines_tech.docx)
* [Activity 5.3.5 Regression Equation Practice](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i3_a535_regression_equation_prac.docx)
* [Activity 5.4.1 Forensic Anthropology](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i4_a541_forensic_anthro.docx)
  + [Presentation](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i4_presentation_forensic_anthro.pdf)
* [Activity 5.4.3a Stadium Wave](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i4_a543a_stadium_wave.docx) (activity to collect and analyze linear data)
* [Activity 5.4.5 Walking Away](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u5_i4_a545_walking_away.docx) (activity to collect and analyze linear data)

**Connecticut Core Standards Algebra II Curriculum:**

Unit 1 – Functions and Inverse Functions

* [Activity 1.2.2 What’s Reasonable?](http://ctcorestandards.org/wp-content/uploads/2015/09/Activity_1_2_2.docx) (determine if a situation is a function)

**EngageNY.org**: open source materials from New York State Common Core Mathematics Curriculum (also found in Eureka-Math)

Algebra I

* Module 1: Relationships Between Quantities and Reasoning with Equations and Their Graphs
  + Topic A: Introduction to Functions Studies This Year – Graphing Stories
* Module 3: Linear and Exponential Functions
  + Topic B: Functions and Their Graphs
    - Lesson 9 – Representing, Naming, and Evaluating Functions
    - Lesson 10 – Representing, Naming and Evaluating Functions
    - Lesson 13 – Interpreting the Graph of a Function

Algebra II

* Module 1: Polynomial, Rational, and Radical Relationships
  + Topic A: Polynomials From Base 10 to Base X
    - Lesson 9 – Radicals and Conjugates
  + Topic C: Solving and Applying Equations – Polynomial, Rational, and Radical
    - Lesson 22 - Equivalent Rational Expressions
    - Lesson 23 – Comparing Rational Expressions
    - Lesson 26 – Solving Rational Equations
    - Lesson 27 – Word Problems Leading to Rational Equations
    - Lesson 28 – A Focus on Square Roots

**Tasks/Lessons:**

“Illustrative Mathematics” (tasks that support each CCSS standard) <https://www.illustrativemathematics.org/content-standards>

Note: <https://illuminations.nctm.org/Lesson> is being updated on a regular basis with new lessons. If you have a specific content area it is easy to search for lessons.

“Sorting Functions” (match graph, equation, table, and rule) <http://map.mathshell.org/tasks.php?unit=HA16&collection=9>

“Representing Functions of Everyday Situations” <http://map.mathshell.org/download.php?fileid=1740>

“Patterns and Functions” entire unit <https://www.youcubed.org/task/patterns-and-functions-unit/>

“Building and Solving Linear Equations” <http://map.mathshell.org/download.php?fileid=1688>

“Movie Lines” linear function <http://www.nctm.org/Classroom-Resources/Lessons/Movie-Lines/>

“Real Life Examples Linear Equations y=mx+b <http://www.sharemylesson.com/teaching-resource/real-life-examples-linear-equation-y-equals-mx-b-50016636/>

“Get the Math” Videos and challenge for Math in Videogames (finding a linear function) <http://www.thirteen.org/get-the-math/the-challenges/math-in-videogames/introduction/16/>

“Get the Math” Videos and challenge for Math in Restaurants (finding a linear function) <http://www.thirteen.org/get-the-math/video/get-the-math-in-restaurants-introduction/179/>

“Super Bowl Advertising Regressions & scatter plots” <http://www.sharemylesson.com/teaching-resource/super-bowl-advertising-regressions-and-amp-scatter-plots-50008194/>

“Space Shuttle Ascent: Mass vs. Time” activity from “Exploring Space Through Math” series from NASA on linear functions and regressions <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_ShuttleMassTime_detail.html>

“Ascent – 50 seconds to MECO activity from “Exploring Space Through Math” series from NASA on linear functions, variables, domain, range, etc. <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_MECO_detail.html>

“Exercising in Space” activity from “Exploring Space Through Math” series from NASA on linear functions (requires TINspire) <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_Exercise_detail.html>

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

“Fuel for the Fire” linear functions <https://education.ti.com/html/Nasa/activities.shtml?utm_campaign=7380%20NASA%20Activity%201&utm_medium=email&utm_source=Eloqua&utm_content=CL7380%20NASA%20Activity%201_1st%20Send>

“You Are What You Eat” concept of line of best fit and linear regression <https://education.ti.com/en/84activitycentral/us/detail?id=E519ADE2AAFD42C3B49D74242317DD29&t=1057D2635ECE4AC997A6E8222616FD18>

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

“Linear Functions” various applets to explore characteristics of linear functions <http://www.geogebra.org/material/simple/id/268505>

“InputOutput Function” linear function where you vary slope and y-intercept and see the impact of each input and output <http://www.geogebra.org/material/simple/id/689605>

“Graph of linear function” sliders with slope and y-intercept <http://www.geogebra.org/material/simple/id/163667>

“Exploring Linear Functions - Common Forms of Linear Equations” [http://www.geogebra.org/material/simple/id/1656547#chapter/56569](http://www.geogebra.org/material/simple/id/1656547" \l "chapter/56569)

“Linear function - properties - scenarios” includes domain, range, and x-intercept <http://www.geogebra.org/material/simple/id/2532507>

“Patterns and Equations” mostly linear investigations <http://www.geogebra.org/material/simple/id/82808>

“Linear or NonLinear Functions” from the graph <http://www.geogebra.org/material/simple/id/193003>

“Linear Lesson” comprehensive with multiple lessons on linear topics <http://www.geogebra.org/material/simple/id/315411>

**Desmos Activities** teacher.desmos.com

Function Carnival – graphing how a variable changes over time vs. the movement itself

Water Line – time/height graphs to model

Polygraph: Lines – describe important features of lines, need pairs of students

Marbleslides: Lines – graphing, functions, linear, transformations, slope (must know about restricted domains)

**Teacher Resources/Games:**

Relation Machines to determine if a relation is a function from tables generated from symbols <http://www.regentsprep.org/Regents/math/ALGEBRA/AP3/Tfunctions.htm>

“Curve Fitting” online tool to place data and fit with linear, quadratic, cubic, etc. <http://phet.colorado.edu/en/simulation/curve-fitting>

**Interactive Online Activities:**

“Function Matching” match your function graph to a given one <http://illuminations.nctm.org/Activity.aspx?id=3520>

“Correlation and the Regression Line” <http://www.nctm.org/Classroom-Resources/Lessons/Correlation-and-the-Regression-Line/>

“Pan Balance – Expressions” input two expressions (somewhat limited) and when you vary the value of x you see the point on the graphs – good to visualize solutions to equations graphically <http://illuminations.nctm.org/Activity.aspx?id=3529>

“Algebra Tiles” <http://illuminations.nctm.org/Activity.aspx?id=3482>

**Videos:**

“LearnZillion” Math video lesson library contains short videos to be used as introductions/warm ups/flipped lesson <https://learnzillion.com/resources/75114-math>

“ What are some real world examples of functions” <https://www.youtube.com/watch?v=qfWM5vyXW7M>

**Other Resources:**

Volume I Activity Sampler (free download of math activities, books of activities available for purchase) Make It Real Learning Company [www.makeitreallearning.com](http://www.makeitreallearning.com)

* Choosing a Cell Phone Plan – Verizon; Investigating Linear Equations

Mathematical Models (free download contains numerous linear, quadratic, exponential, etc. sets of data for modeling) Make It Real Learning Company [www.makeitreallearning.com](https://www.mail.commnet.edu/owa/redir.aspx?C=YUfa5DLYoEmUWv6x5b5_ze0kScZLOdMIBg9A4lEH61_w40IyZTgYnxRKcq7z_XSK3CyPSWM9sjA.&URL=http%3a%2f%2fwww.makeitreallearning.com)

**Exponential Functions**

**AMATYC The Right Stuff: Appropriate Mathematics for all students**

* 12.0 Looking into the future…. Value: Linear and exponential functions (select 12 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>

**Connecticut Core Standards Algebra I Curriculum:**

Unit 7 – Intro to Exponential Functions:

* [Activity 7.1.2 Is it a Good Deal](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i1_a712_good_deal.docx) (example of doubling)
* [Activity 7.2.1 Exploring Growth Patterns](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i2_a721_expl_grow_patterns.docx)
* [Activity 7.3.1 Building Walls](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i3_a731_building_walls.doc)
* [Activity 7.3.4 Modeling Exponential Growth and Decay Using Parameters](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i3_a734_model_expon_grow_decay_param.doc)
* [Activity 7.4.1 Tossing M and Ms](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i4_a741_toss_M_Ms.docx) (activity to collect and analyze exponential data)
* [Activity 7.5.2 Percent Change and Exponential Functions](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i5_a752_percent_change_expon_func.docx)
* [Activity 7.5.3 Percent Change Situations](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i5_a753_percent_change_situa.docx)
* [Activity 7.5.4 Modeling Exponential Functions – What is the Percent Change](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i5_a754_mod_expon_func_what_per_change.docx)
* [Activity 7.5.6 Doubling Time and Half Life](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i5_a756_doubling_time_half_life.docx)
* [Activity 7.6.1 The Mathematics of Global Warming](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i6_a761_math_global_warm.docx)
* [Activity 7.6.2 Countering Global Warming](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u7_i6_a762_coun_glo_warm.docx)

**Connecticut Core Standards Algebra II Curriculum:**

* Module 3: Linear and Exponential Functions
  + Topic A: Linear and Exponential Sequences
    - Lesson 4 - Simple Interest vs. Compound Interest
    - Lesson 5 – The Power of Exponential Growth
    - Lesson 6 – Exponential Growth – U.S. Population and World Population
    - Lesson 7 – Exponential Decay
  + Topic B:
    - Lesson 14 – Linear and Exponential Models – Comparing Growth Rates
  + Topic D: Using Functions and Graphs to Solve Problems
    - Lesson 21 – Comparing Linear and Exponential Functions Again
    - Lesson 22 – Modeling and Invasive Species Population

**Tasks/Lessons:**

“Linear or Exponential?” determine whether situations are linear or exponential <https://www.illustrativemathematics.org/content-standards/tasks/629>

“Drug Filtering” exponential decay application <http://www.nctm.org/Classroom-Resources/Lessons/Drug-Filtering/>

“National Debt and Wars” linear and exponential curve fitting <https://illuminations.nctm.org/Lesson.aspx?id=2272>

“Xbox Xponential” models exponential situation <http://achievethecore.org/content/upload/Grade%20HS%20Mathalicious%20lesson%20-%20XBox%20Xponential%20FINAL.pdf>

“Does Paying Down a Mortgage Save you Money?” activity comparing a 30 year mortgage with a 20 year one <http://www.sharemylesson.com/teaching-resource/does-paying-down-a-mortgage-save-you-money-50009201/>

“Paper Folding” – find how many folds of a piece of paper to get to the moon (includes video of Myth Busters) <https://www.illustrativemathematics.org/content-standards/tasks/2114>

“US Population 1790 – 1860”: compare linear and exponential function for situation <https://www.illustrativemathematics.org/content-standards/tasks/354>

“Exponential Paramaters” exponential growth and bacteria <https://www.illustrativemathematics.org/content-standards/tasks/2116>

“National Debt and Wars” exponential model <http://www.nctm.org/Classroom-Resources/Lessons/National-Debt-and-Wars/>

“Predicting the Past” using exponential models <https://www.illustrativemathematics.org/content-standards/tasks/2127>

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

“Guppies and Frogs” linear and exponential growth modeling <https://education.ti.com/en/84activitycentral/us/detail?id=A6834E1333734A46B81C54599B60A0C6&t=AE7D5DE8BBF94DD8A010D9F03214C317>

“Spreading Doom” modeling an exponential situation (spread of a computer virus) <https://education.ti.com/en/84activitycentral/us/detail?id=874E6ECB7E8045938E654C576077ABAC&t=AE7D5DE8BBF94DD8A010D9F03214C317>

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

“Exponential Functions” varies only the base <http://www.geogebra.org/material/simple/id/1257733>

“Exponential Function Parameters” a, b, and c <http://www.geogebra.org/material/simple/id/95961>

“Explore exponential vs. linear functions” sliders for both slope and base to compare/contrast <http://www.geogebra.org/material/simple/id/15263>

**Teacher Resources/Games:**

Practice with Applied Exponential Growth and Decay <http://www.regentsprep.org/Regents/math/ALGEBRA/AE7/ExpDecayP.htm>

Activity for Exponential Growth and Decay (similar to M&M lab) <http://www.regentsprep.org/Regents/math/ALGEBRA/AE7/ExpDecayR.htm>

**Videos:**

“How folding paper can get you to the moon by Adrian Paenza (introduction to exponential growth) <http://ed.ted.com/lessons/how-folding-paper-can-get-you-to-the-moon#watch>

“Paper Folding” – find how many folds of a piece of paper to get to the moon (includes video of Myth Busters) <https://www.illustrativemathematics.org/content-standards/tasks/2114>

“The Power of Exponentials, Big and Small” and additional resources <https://blossoms.mit.edu/videos/lessons/power_exponentials_big_and_small>

“The Shrinking Dollar” visualize exponential decay (2nd video) <http://mrmeyer.com/threeacts/shrinkingdollar/>

**Other Resources:**

Volume I Activity Sampler (free download of math activities, books of activities available for purchase) Make It Real Learning Company [www.makeitreallearning.com](http://www.makeitreallearning.com)

* Shopper Center Planning; Looking at Exponential and Linear Models

**Quadratic Functions**

**AMATYC The Right Stuff: Appropriate Mathematics for all students**

* 6.0 Hurricanes – This will blow you away: Quadratic Functions (select 6 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 10.0 Minimizing Distance to a Cell Phone Tower: Geometry, Modeling (Linear and Quadratic), and Optimization (select 10 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 3.0 Super Snacks: Quadratic modeling (select 3 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>

**Connecticut Core Standards Algebra I Curriculum:**

Unit 8– Quadratic Functions

* [Activity 8.1.1 Quadratics in the Kitchen](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u8_i1_a811_quadratics_kitchen.docx)
* [Activity 8.1.4 Quadratic Functions by Table](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u8_i1_a814_quad_func_table.docx)
* [Activity 8.1.6 Exploring the Parameters of y = ax^2 + bx + c](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u8_i1_a816_exploring_parameters_y.docx)
* [Activity 8.4.3 Password](http://ctcorestandards.org/wp-content/uploads/2014/12/alg_u8_i4_a843_password.docx) (various forms of a quadratic function and vertex and zeros)

**Connecticut Core Standards Algebra II Curriculum:**

Unit 2 – Quadratic Functions

* [Launch 2.2 Crumpled Paper Toss](http://ctcorestandards.org/wp-content/uploads/2015/07/Investigation_2_2_StudentLaunchSheet_061115.docx)
* [Teacher Launch 2.2 Notes for Crumpled Paper Toss](http://ctcorestandards.org/wp-content/uploads/2015/07/Investigation_2_2_TeacherLaunchNotes_061115.docx)
* [Activity 2.5.1a Home Run Ball](http://ctcorestandards.org/wp-content/uploads/2015/07/Activity_2_5_1a_071115.docx) (model situation with a quadratic function)
* [Activity 2.5.4a Historic Hotels](http://ctcorestandards.org/wp-content/uploads/2015/07/Activity_2_5_4a_071115.docx) (model situation with a quadratic function)

**EngageNY.org**: open source materials from New York State Common Core Mathematics Curriculum (also found in Eureka-Math)

* Module 4: Polynomial and Quadratic Expressions, Equations, and Functions
  + Topic A: Quadratic Expressions, Equations, Functions, and Their Connection to Rectangles
    - Lesson 1 – Multiplying and Factoring Quadratic Expressions
    - Lesson 2 – Multiplying and Factoring Polynomial Expressions
    - Lesson 3 – Advanced Factoring Strategies for Quadratic Expressions
    - Lesson 4 – Advanced Factoring Strategies for Quadratic Expressions
    - Lesson 5 – The Zero Product Property
    - Lesson 6 – Solving Basic One-Variable Quadratic Equations
    - Lesson 7 – Creating and Solving Quadratic Equations in One Variable
    - Lesson 8 – Exploring the Symmetry in Graphs of Quadratic Functions
    - Lesson 9 – Graphing Quadratic Functions from Factored Form, 
    - Lesson 10 – Interpreting Quadratic Functions from Graphs and Tables
  + Topic B: Using Different Forms for Quadratic Functions
    - Lesson 15 – Using the Quadratic Formula
    - Lesson 16 – Graphing Quadratic Equations from the Vertex Form 
    - Lesson 17 – Graphing Quadratic Functions from the Standard Form 
* Module 4: Polynomial and Quadratic Expressions, Equations, and Functions
  + - Lesson 23 – Modeling with Quadratic Functions

**Tasks/Lessons:**

“Fall of Javert” could be used as an introduction to a quadratic function <http://www.mathalicious.com/lessons/the-fall-of-javert>

“Representing Quadratic Functions Graphically” <http://map.mathshell.org/download.php?fileid=1734>

“Egg Launch Contest” multiple representations of quadratic functions <https://illuminations.nctm.org/Lesson.aspx?id=2650>

“Hanging Chains” modeling a quadratic function using a hanging chain <https://illuminations.nctm.org/Lesson.aspx?id=2105>

“Factored Form of a Quadratic Function” <http://achievethecore.org/page/863/factored-form-of-a-quadratic-function-detail-pg>

“What goes up” modeling projectile motion with a quadratic function <http://betterlesson.com/lesson/448620/what-goes-up-day-1-of-3>

“Representational Relationships of Lines and Parabolas” E-example from NCTM Illuminations <https://illuminations.nctm.org/Activity.aspx?id=6373>

“ Profit of a Company, Assessment Variation” distinguishing between three equivalent quadratic functions <http://achievethecore.org/page/883/profit-of-a-company-assessment-variation-detail-pg>

“Get the Math” Videos and challenge Math in Basketball (finding a quadratic function) <http://www.thirteen.org/get-the-math/the-challenges/math-in-basketball/introduction/181/>

“Functions” (linear and quadratic) <http://map.mathshell.org/tasks.php?unit=HA07&collection=9>

“Medieval Archer” transformation of quadratic function <https://www.illustrativemathematics.org/content-standards/tasks/695>

“Factoring quadratics starter” powerpoint to start factoring trinomial <http://www.sharemylesson.com/teaching-resource/factoring-quadratics-starter-6030130/>

“Quadratic Sequence I” patterns and solving quadratic equations using the square root method <https://www.illustrativemathematics.org/content-standards/tasks/2121>

“Quadratic Sequence II” more with patterns and solving quadratic equations using the square root method <https://www.illustrativemathematics.org/content-standards/tasks/2122>

“Visualizing Completing the Square” uses algebra tiles <https://www.illustrativemathematics.org/content-standards/tasks/1827>

“Two Squares are Equal” using and comparing various methods for solving quadratic equations <https://www.illustrativemathematics.org/content-standards/tasks/618>

“Springboard Dive” application of quadratic function <https://www.illustrativemathematics.org/content-standards/tasks/375>

“Throwing Baseballs” application of quadratic function, comparing two quadratic functions’ vertex <https://www.illustrativemathematics.org/content-standards/tasks/1279>

“Weightless Wonder” activity from “Exploring Space Through Math” series from NASA on quadratic functions <http://www.nasa.gov/audience/foreducators/exploringmath/algebra1/Prob_WeightlessWonder_detail.html>

“Space Shuttle Ascent: Altitude vs. Time - data and quadratic regression <http://www.sharemylesson.com/teaching-resource/space-shuttle-ascent-altitude-vs-time-50028724/>

“How Did I Move?” linear, exponential, and quadratic functions <http://www.nctm.org/Classroom-Resources/Lessons/How-Did-I-Move_/>

“How Should I Move? Linear exponential, and quadratic functions (need motion detector) <http://www.nctm.org/Classroom-Resources/Lessons/How-Should-I-Move_/>

“Swine Flu Data” compare linear, exponential, and quadratic models for this data <https://www.teacherspayteachers.com/Product/SWINE-FLU-DATA-43287>

“Rainforest Deforestation – Problem or Myth?” compare models that are linear, exponential, and quadratic functions <https://illuminations.nctm.org/Lesson.aspx?id=3820>

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

“Stacking Bricks” find a pattern and model with a quadratic function

<https://education.ti.com/en/84activitycentral/us/detail?id=F37D7F51EB70498C875A10BF67D00E03&t=05C02D74BC6D4748B1E83958C1A7ECA2>

“Graphing Quadratic Functions” explore impact that the constants, a, b, and c, have on the graph of the function (uses APP called Transfrm) <https://education.ti.com/en/84activitycentral/us/detail?id=26347906DEF24F8F97F089F6EFC061A1&t=D8B8C220FB134AD79C21D8694DBC2704>

“Using Symmetry to Find the Vertex of a Parabola” develops intuitive understanding of vertex and axis of symmetry <https://education.ti.com/en/84activitycentral/us/detail?id=4209A85E866C4EA19982387DEBDD8B2A&t=D8B8C220FB134AD79C21D8694DBC2704>

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

“Quadratic Explorer” sliders for a, b, and c and includes vertex, y-intercept and x-intercepts <http://www.geogebra.org/material/simple/id/963645>

“Exploring Quadratic Functions” in standard form by varying a, b, c <http://www.geogebra.org/material/simple/id/948451>

“Quadratic Function Exploration” standard, vertex, and factored forms <http://www.geogebra.org/material/simple/id/1689909>

“Explore Transformations of Quadratic Functions” in vertex form <http://www.geogebra.org/material/simple/id/2080341>

“Investigating the Factored Form of a Quadratic Equation” vary the factors and see the graph <http://www.geogebra.org/material/simple/id/112735>

“Solve Quadratic Equations” shows discriminant, solution, and graph <http://www.geogebra.org/material/simple/id/27328>

“Parabolas and quadratic equations” includes completing the square to change forms <http://www.geogebra.org/material/simple/id/1055255>

**Desmos Activities** teacher.desmos.com

Will It Hit the Hoop – good introduction to quadratic functions transitioning from linear functions

Polygraph: Parabolas – develops formal vocabulary for parabolas, need pairs of students

Marbleslides: Parabolas - vertex form of a quadratic equation and restricted domains

Penny Circle - a desmos activity to distinguish between linear, exponential, and quadratic functions, includes regression

**Teacher Resources/Games:**

Intro to Applications of Quadratic Functions – A Dolphin Jump <https://www.teacherspayteachers.com/Product/Intro-to-Applications-of-Quadratic-Functions-A-Dolphin-Jump-1528004>

Factoring with Algebra Tiles <http://regentsprep.org/Regents/math/ALGEBRA/AV6/facttiles.htm>

Using Algebra Tiles to help solve Quadratic Equations by Factoring <http://www.regentsprep.org/Regents/math/ALGEBRA/AE5/TRFacEq.htm>

Using the graphing calculator to investigate parabolas <http://www.regentsprep.org/Regents/math/ALGEBRA/AC4/Tparab.htm>

Quadratic Matching – standard form, factored form, solutions, and graph <http://mathbits.com/AlgebraBits/Quadratic%20Matching.pdf>

**Videos:**

“Quadratic Functions and Parabolas in the Real World” nice images <https://www.youtube.com/watch?v=He42k1xRpbQ>

**Other Resources:**

Volume I Activity Sampler (free download of math activities, books of activities available for purchase) Make It Real Learning Company [www.makeitreallearning.com](http://www.makeitreallearning.com)

* United States Population; Using Quadratic Models

**Rational Functions**

**AMATYC The Right Stuff: Appropriate Mathematics for all students**

* 11.0 What if… : Problem solving with multiple representations of functions (quadratic, rational, logistic, and exponential) (select 11 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 17.0 Math of Finance: Exponential and Power Functions (select 17 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>

**Connecticut Core Standards Algebra II Curriculum:**

Unit 4 – Rational and Power Functions

* [Activity 4.3.4 Applications of Rational Functions](http://ctcorestandards.org/wp-content/uploads/2015/08/Activity_4_3_4.docx)
* [Activity 4.3.7 Queueing Theory Application](http://ctcorestandards.org/wp-content/uploads/2015/08/Activity_4_3_7.docx)
* [Activity 4.4.1 Rational Expressions I](http://ctcorestandards.org/wp-content/uploads/2015/08/Activity_4_4_1.docx)

**Tasks/Lessons:**

“Get the Math” Videos and challenge for Math in Special Effects (light intensity and distance – inverse square – need special equipment) <http://www.thirteen.org/get-the-math/the-challenges/math-in-special-effects/introduction/243/>

“Lights on the International Space Center” ” activity from “Exploring Space Through Math” series from NASA on inverse square variation <http://www.nasa.gov/audience/foreducators/exploringmath/algebra2/Prob_LightsISS_detail.html>

“Average Cost” rational function <https://www.illustrativemathematics.org/content-standards/tasks/387>

“The Canoe Trip – Variation I” rational functions and asymptotes <https://www.illustrativemathematics.org/content-standards/tasks/386>

“Graphing Rational Functions” explore parameters with use of sliders <https://www.illustrativemathematics.org/content-standards/tasks/1694>

“Domain Representations” domains of various functions (through rational functions) from graphs, tables, number lines, and symbols <https://illuminations.nctm.org/Lesson.aspx?id=2071>

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

“Constant of Variation” direct and inverse variation <https://education.ti.com/en/84activitycentral/us/detail?id=C38940FD71CA4DE08467D591DF0970F5&t=2E085A1344974A24B3139A562780BE5A>

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

“Investigate A: Graph of a Rational Function” investigate graph of 1/x <http://www.geogebra.org/material/simple/id/1123751>

“Challenge – Rational F’ns & Asymptotic Behavior” comprehensive exploration of various types of rational functions <http://www.geogebra.org/material/simple/id/97472>

“Rational Function Discovery” can look at various types of rational functions’ graphs <http://www.geogebra.org/material/simple/id/29618>

“Types of Rational Functions” explore impact of constant and parameters on various types of rational functions <http://www.geogebra.org/material/simple/id/125556>

**Videos:**

“Rational Expressions in the Real World” <https://www.youtube.com/watch?v=5BVSRj_ZEuM&nohtml5=False>

**Radical Functions**

**Connecticut Core Standards Algebra II Curriculum:**

Unit 2 – Quadratic Functions

* Activity 2.6.1 Radical Functions

**EngageNY.org**: open source materials from New York State Common Core Mathematics Curriculum (also found in Eureka-Math)

* Module 4: Polynomial and Quadratic Expressions, Equations, and Functions
  + Topic C: Function Transformations and Modeling
    - Lesson 18 – Graphing Cubic, Square Root, and Cube Root Functions
    - Lesson 22 – Comparing Quadratic, Square Root, and Cube Root Functions Represented in Different Ways

**Graphing Calculator Activities**

(Texas Instruments: <https://education.ti.com/en/us/activities-home>)

“Radical Transformations” explore transformations on the basic square root function <https://education.ti.com/en/84activitycentral/us/detail?id=3FE56C10EF57478CB386AE374A96BEDD&t=632C9D5E616E4C03ABB301E7B402C773>

“Roots of Radical Equations” solving radical equations graphically <https://education.ti.com/en/84activitycentral/us/detail?id=1CAD753DAE8D4539B4F2A92008BCA9B1&t=632C9D5E616E4C03ABB301E7B402C773>

**Geogebra:** Materials and Downloads **<http://tube.geogebra.org/>**

“Exploring Power Functions” and can compare two power functions <http://www.geogebra.org/material/simple/id/56286>

“Square Root Transformations” a, h, and k <http://www.geogebra.org/material/simple/id/2180353>

**Teacher Resources/Games:**

Applied Problems with Radical Equations <http://www.regentsprep.org/Regents/math/algtrig/ATE10/radModelprac.htm>

Lab: Practicing Radical Equations (multiple representations) <http://regentsprep.org/Regents/math/algtrig/ATE10/radLAB.htm>

**Alternatives to Intermediate Algebra:**

New Mathways Project, Charles A. Dana Center, University of Texas <http://www.utdanacenter.org/higher-education/new-mathways-project/>

* The New Mathways Project Curricular Materials <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/>
* NMP Curriculum Design Standards <http://www.utdanacenter.org/wp-content/uploads/NMP_curriculum_design_standards_Sept2013.pdf>
* Courses:
  + “Foundations of Mathematical Reasoning” course <http://www.utdanacenter.org/wp-content/uploads/NMP_curriculum_design_standards_Sept2013.pdf> (available as a MyMathLab course through Pearson)
  + “Frameworks for Mathematics and Collegiate Learning” course - a first year experience type course which is a co-requisite to the Foundations course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/frameworks-for-mathematics-and-collegiate-learning/>
  + “Quantitative Reasoning” course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/quantitative-reasoning-course/> (available as a MyMathLab course through Pearson)
  + “Statistical Reasoning” course <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/statistical-reasoning-course/> (available as a MyMathLab course through Pearson)
  + STEM-Prep Pathway <http://www.utdanacenter.org/higher-education/new-mathways-project/new-mathways-project-curricular-materials/stem-prep-pathway-i-and-ii/>
    - “Reasoning with Functions I” under development but the pilot is available as a MyMathLab course through Pearson (Spring 2016)
    - “Reasoning with Functions II” to be developed

Complete College America “Transform Remediation – the Co-Requisite Course Model” <http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final(1).pdf>

**Additional Information Regarding the Importance of Pedagogy:**

### [Dylan Wiliam-Pedagogy Trumps Curriculum - YouTube](https://www.youtube.com/watch?v=-y3tN_1CiRk)

<https://www.youtube.com/watch?v=-y3tN_1CiRk>

“Taking College Teaching Seriously: Pedagogy Matters! Fostering Student Success Through Faculty-Centered Practice Improvement” Gail Mellow, Diana Woolis, Marisa Klages-Bombich, Susan Restler <https://takingcollegeteachingseriously.kpublic.net/home>