**Intermediate Algebra Sabbatical Project 2016**

**Resources Organized by Type**

**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.

**AMATYC The Right Stuff: Appropriate Mathematics for all students** “Promoting materials that engage students in meaningful activities, promote the effective use of technology to support the mathematics, further equip students with stronger problems solving and critical thinking skills, as well as enhance numeracy. “ <https://amatyc.site-ym.com/?page=therightstuff&hhSearchTerms=%22right+and+stuff+and+materials%22>

* 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
* 12.0 Looking into the future…. Value: Linear and exponential functions (select 12 at top) <http://therightstuff.matyc.org/RSmods2009/index.html>
* 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>
* 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 I Curriculum:**  “This model Algebra 1 curriculum created by CT teachers and students for CT teachers and students emphasizes problem solving and mathematical reasoning, incorporates real-world applications and effective use of technology, and uses multiple representations.” Units of instruction are: Patterns, Equations and Inequalities, Functions, Linear Functions, Scatter Plots and Trend Lines, Systems of Equations, Intro to Exponential Functions, Quadratic Functions. <http://ctcorestandards.org/?page_id=6311> Selected Lessons, Activities, and references that are relevant to our Intermediate Algebra curriculum are referenced below:

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)

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)

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)

**Algebra II Curriculum:**  “This model Algebra II curriculum created by CT teachers and students for CT teachers and students emphasizes problem solving and mathematical reasoning, incorporates real-world applications and effective use of technology, and uses multiple representations.” Units of instruction are: Functions and Inverse Functions, Quadratic Functions, Polynomial Function, Rational and Power Functions, Exponential and Logarithmic Functions, Trigonometric Functions. <http://ctcorestandards.org/?page_id=9840> Selected Lessons, Activities, and references that are relevant to our Intermediate Algebra curriculum are referenced below:

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)

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)
* Activity 2.6.1 Radical Functions

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)

**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 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: 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
    - 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
* 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 
  + 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
    - Lesson 23 – Modeling with Quadratic Functions
* Module 5: A Synthesis of Modeling with Equations and Functions
  + Topic A: Elements of Modeling
    - Lesson 2 – Analyzing a Data Set
    - Lesson 3 – Analyzing a Verbal Description
  + Topic B: Completing the Modeling Cycle
    - Lesson 6 – Modeling a Context from Data
    - Lesson 7 – Modeling a Context from Data (using regression)

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>

“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>

“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>

“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>

Also, see books category below for more tasks

**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>

“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>

“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>

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

“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/**](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>

“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>

“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>

“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>

“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>

“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>

**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)

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:** https://www.youtube.com/watch?v=5BVSRj\_ZEuM&nohtml5=False

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>

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>

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>

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

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>

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>

**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>

“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/>

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

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

**Books:**

“Implementing the Common Core State Standards through Mathematical Problem Solving – High School”; Theresa J. Gurl, Alice F. Artzt, Alan Sultan 2012 (includes numerous tasks appropriate for Intermediate Algebra)

* Tasks 1.1 and 1.2, pages 4-5, polynomial factoring
* Task 1.3, page 7, rational expressions, subtracting rational expressions
* Task 1.4, page 8, area and perimeter of a rectangle, polynomials
* Task 1.5, page 10, quadratic function
* Task 1.6, page 13, relationship between a “rule” and the graph – linear function
* Task 2.1, page 20, function vs. not a function
* Task 2.2, page 21, function notation
* Task 2.3, page 21, function vs. not a function common misconceptions
* Task 2.4, page23, function and domain of a function
* Task 2.7, page 28, comparing linear and exponential functions
* Task 2.8, page 29, find linear and exponential functions symbolically
* Task 2.9, page 30, exponential application (could launch exponential function unit)
* Task 4.1, page 53, linear data to graph and model with regression
* Task 4.2, page 56, r-value of line of best fit
* Task 4.3, page 57, use linear regression to make predictions
* Task 5.1, page 72, rational exponents and roots

“Putting Essential Understanding of Functions into Practice 9-12”; Robert Ronau, Dan Meyer, Terry Crites; NCTM 2014 (instructional approach of this book and tasks included is a combination of a student-centered perspective and teaching through problem solving, tasks are found in Appendix 3)

* Function Wall, page 148, understand the definition of a function
* Function Finder, page 150, understand the definition of a function
* Lake Depth, page 151, covariation – patterns in how two variables change together
* Falling Object, page 161, quadratic functions and rate of change
* Sliding Ladder, page 164, exponential functions and rate of change
* Velocity of One Car, page 175, graphs as representations of functions 1
* Comparing Two Cars, Given Distance, page 178, graphs as representations of functions 2
* Comparing Two Cars, Given Speed, page 180, graphs as representations of functions 3
* Two Walks, page 182, graphs as representations of functions 4

“Principles to Actions: Ensuring Mathematical Success for All” Steven Leinwand, et al; NCTM 2014 (contains a task appropriate for Intermediate Algebra, also has other tasks appropriate for Elementary Algebra)

* Task in Figure 6, page 21, base of exponential function

“NCSM Great Tasks for Mathematics 6-12, Schrock, C., Norris, K., Pugalee, D., Seitz, R. and Hollingshead, F.

## *NCSM Great Tasks for Mathematics 6-12*

Schrock, C., Norris, K., Pugalee, D., Seitz R. and Hollingshead, F.

**Other Resources:**

Khan Academy – videos and problems <https://www.khanacademy.org/>

Free Worksheets (skill and drill) <http://kutasoftware.com/freemain.html>

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
* Shopper Center Planning; Looking at Exponential and Linear Models
* United States Population; Using Quadratic Models

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)

**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>