Mathematical Functions Why Do I Need to Know About Them?

Resources

Tuesdays for Teachers
February 28, 2017

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Table of Contents

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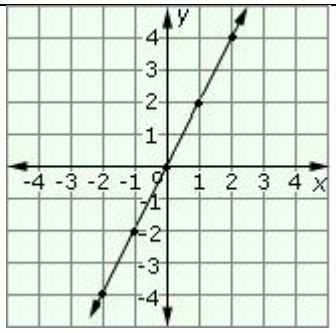
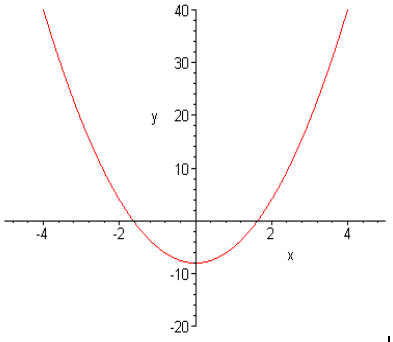
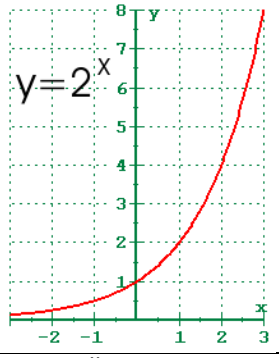
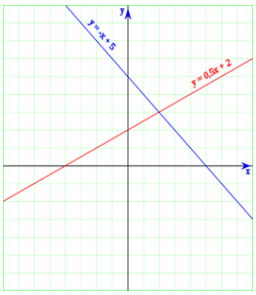
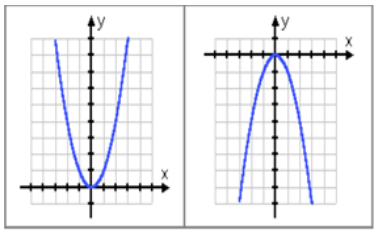
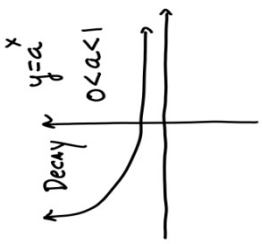
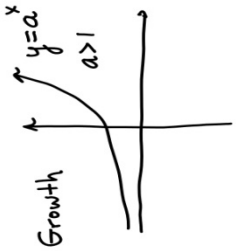
Mathematical Reasoning – High Impact Indicators

Assessment Target	Indicators	What to look for in student work. The student can
A.7 Compare, represent, and evaluate functions	• **A.7.a** Compare two different proportional relationships represented in different ways. Examples include but are not limited to: compare a distance-time graph to a distance-time equation to determine which of two moving objects has a greater speed. • **A.7.b** Represent or identify a function in a table or graph as having exactly one output (one element in the range) for each input (each element in the domain). • **A.7.c** Evaluate linear and quadratic functions for values in their domain when represented using function notation. • **A.7.d** Compare properties of two linear or quadratic functions each represented in a different way (algebraically, numerically in tables, graphically or by verbal descriptions). Examples include but are not limited to: given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	• identify functions and non-functions displayed in graphs and tables, and create functions (graphs/tables). • substitute values for variables in functions and evaluate the resulting numerical expressions. • convert functional representations from one from to another, and compare properties of the functions.

Vocabulary

domain	the set of input values or *x*-values of a function
function	a relationship between variables that has one output for each and every input
linear function	a function in which the highest power associated with the independent variable is 1
linear function	a function that is represented by a line when graphed on a Cartesian plane
range	the set of output values or *y*-values of a function
slope	a ratio of the rate at which the dependent variable is changing versus the rate at which the independent variable is changing; frequently expressed as $\frac{\text{rise}}{\text{run}}$, or $\frac{\text{change in } y}{\text{change in } x}$
y-intercept	the point on the *y*-axis at which a function crosses the *y*-axis
slope-intercept form	the form $y = mx + b$ of a linear equation, where m represents the slope of the line and b represents its *y*-intercept
absolute value	the distance a number is from zero on a number line; the value of a number ignoring its sign (+ or −)
origin	the point of intersection of the *x*-axis and *y*-axis on a Cartesian plane
Cartesian plane	a plane which has a horizontal line (x axis) and a vertical line (y axis), also known as a coordinate plane or grid

Linear, Quadratic, and Exponential Function Graphs

Type of Function	Linear	Quadratic	Exponential
Description	Straight line	U Shape (parabola) that opens up or down	Grows/Shrinks fast and levels off on 1 side
Graph			
Equation	f(x) = ax + b or f(x) = a	$f(x) = ax^2 + bx + c$	$f(x) = a^x$
How to tell from the equation what the graph looks like:	The x term is to the first power (x)	The x term is to the second power (x^2)	The x term is the exponent (2^x)
Graph specific information:	In the equation y = mx + b, if m is negative, the line **decreases** (goes down) as we look from left to right: y = - x + 5 If m is positive, the line **increases** (goes up) as we look from left to right: y = .5x + 2 	If the number with the x^2 is negative, the U shape opens down. If the number with the x^2 is positive, the U shape opens up: 	In the equation $y = a^x$, if a is larger than 1 the curve will grow fast. If a is between 0 and 1, the curve will shrink fast.  

Steve Schmidt, Appalachian State University

Resources Referenced in the Presentation

The following are the titles and urls of the websites and resources referenced in the presentation. They are listed in the order that they appeared.

Patterns, Functions, and Algebra – Annenberg Learner
https://www.learner.org/courses/learningmath/algebra/

Math in Practice Series from NCTM: *Putting Essential Understanding of Functions into Practice* - Robert Ronau, Dan Meyer, Terry Crites

Using a Lottery to Illustrate Functions - The Teaching Channel
https://www.teachingchannel.org/videos/teaching-functions?utm_source=Alpha+List&utm_campaign=17fa2b7690-

Speeding Along – A Lesson Plan from Florida IPDAE
http://www.floridaipdae.org/index.cfm?fuseaction=resources.GEDAHS&cagiid=A37BC967EEFD18737E7AC2AF2D8421DD4A11C694934330A61EB65F4EB10E766B

Functions – Khan Academy
https://www.khanacademy.org/math/algebra/algebra-functions

What is a function? https://www.youtube.com/watch?v=ryQJa8ybxVY

Math is Fun https://www.mathsisfun.com/sets/function.html

Virtual Nerd http://www.virtualnerd.com/

Illuminations https://illuminations.nctm.org/

Algebraic Functions and Modeling – Steve Schmidt, Appalachian State
https://abspd.appstate.edu/node/385

Linear Equations, Functions, and Graphs – Khan Academy
https://www.khanacademy.org/math/algebra-home/alg-linear-eq-func

Beginning Algebra – IPDAE
http://www.floridaipdae.org/index.cfm?fuseaction=resources.GEDAHS&cagiid=DA077C783C76A85D93EE670F44851D4C70E44B31245B6D1B60A314A7FABD6FAE

What Are Functions? – Math Antics https://www.youtube.com/watch?v=52tpYl2tTqk

Insights Into Algebra 1 – The Annenberg Learner
https://www.learner.org/workshops/algebra/index.html

Properties of Functions – The Math Dude
http://www.montgomeryschoolsmd.org/departments/itv/MathDude/watch-online.aspx?id=31

Exponential Functions and Quadratic Functions – Khan Academy
https://www.khanacademy.org/math/algebra/introduction-to-exponential-functions
https://www.khanacademy.org/math/algebra/quadratics#features-of-quadratic-functions

Inside Mathematics
http://www.insidemathematics.org/common-core-resources/mathematical-content-standards/standards-by-grade/high-school-functions

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