

STRAND 5: POWER, POLYNOMIAL, AND RATIONAL FUNCTIONS

TOPIC 5.1: POWER FUNCTIONS

Topic Notes

Mathematical focus

Participants investigate behavior of power functions using a graphing calculator.

Topic overview

While power functions are not specifically noted in the Algebra II TEKS, they are the building blocks of polynomial functions, from which rational functions are built. Power functions are of the form $y = kx^p$. For power functions where p is a natural number, they are a subset of polynomial functions that are not often examined as a group of their own. As a precursor to investigating polynomials and rational functions, we will analyze interesting properties of some power functions. By examining both the long run and short run behavior of power functions, participants will make connections between the parameters of a power function (the multiplying constant k and the exponent p) and the graph.

This topic includes 3 tasks:

Task 5.1.1: Introduction to Power Functions

Task 5.1.2: Comparing Power Functions

Task 5.1.3: Comparing Functions: Who Wins?

TEXES standards focus

TEXES Standard II.004 Patterns and algebra. The teacher uses patterns to model and solve problems and formulate conjectures. The beginning teacher:

(A) Recognizes and extends patterns and relationships in data presented in tables, sequences, or graphs.

TEXES Standard II.005 Patterns and algebra. The teacher understands attributes of functions, relations, and their graphs. The beginning teacher:

(B) Identifies the mathematical domain and range of functions and relations and determines reasonable domains for given situations.

TEXES Standard V.018 Mathematical processes and perspectives. The teacher understands mathematical reasoning and problem solving. The beginning teacher:

(D) Uses formal and informal reasoning to justify mathematical ideas.

(E) Understands the problem-solving process (i.e., recognizing that a mathematical problem can be solved in a variety of ways, selecting an appropriate strategy, evaluating the reasonableness of a solution).

TEKS/TAKS focus

TEKS 2A.1 Foundations for functions. The student uses properties and attributes of functions and applies functions to problem situations.

TEKS 2A.4 Algebra and geometry. The student connects algebraic and geometric representations of functions.

High School TAKS Objective 1: The student will describe functional relationships in a variety of ways.

High School TAKS Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

High School TAKS Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

Materials

Task	Task 5.1.1 Intro to Power Functions	Task 5.1.2 Comparing Power Functions	Task 5.1.3 Comparing Functions: Who Wins?
Graphing calculator	x	x	x
Large grid paper			x

Procedure

These tasks build upon each other and are necessary for Topic 5.2 on polynomials. If you are short on time, then Task 5.1.3 would make a good homework investigation.

Summary

The big idea here is that power functions with the same coefficient may be compared using their exponents and that the comparison depends upon whether or not the interval is greater than or less than 1. Functions may have the same long run behavior, but one increases faster than the other does.

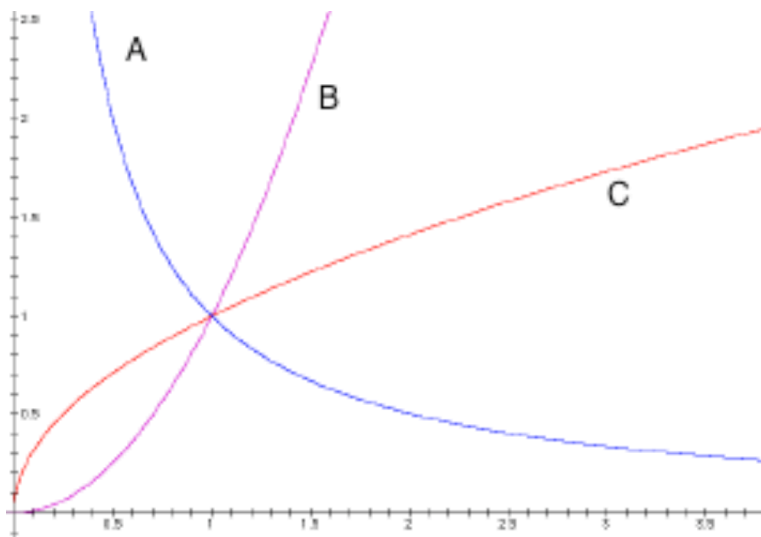
Assessment**Reflect and Apply**

Match:

_____ 1. $y = x^p$, $p > 1$

_____ 2. $y = x^p$, $0 < p < 1$

_____ 3. $y = x^p$, $p < 0$



4. Suppose that $f(-1) = \frac{3}{4}$ and $f(2) = 48$.

- Assume that f is a linear function. Find a possible formula for $f(x)$.
- Assume that f is an exponential function. Find a possible formula for $f(x)$.
- Assume that f is a power function. Find a possible formula for $f(x)$.

*Reflect and Apply Answers:***1. B****2. C****3. A**

4 a. $y = 15.75x + 16.5$

b. $y = 3(4)^x$ (and others)

c. $y = 0.75x^6$ (and others)

Transitions to the classroom

Which of the tasks are appropriate only for teachers? Which for students? How would we modify a teacher task to make it student appropriate?

	Teacher use only	Modify for students	Ready for students
Task 5.1.1	*		
Task 5.1.2	*		
Task 5.1.3	*		