# Algebra 2B Study Guide
# Credit by Exam for Credit Recovery or Acceleration

The exam you are interested in taking is designed to test your proficiency in the relevant subject matter. You should be thoroughly familiar with the subject matter before you attempt to take the exam. This CBE CR/A Study Guide can help you prepare for the exam by giving you an idea of what you need to review. You can check your familiarity level by reviewing the Texas Essential Knowledge and Skills (TEKS) for this course. (See below.) To refine your skills, you can refer to any of the state-adopted textbooks.

## Texas Essential Knowledge and Skills (TEKS)

Every question that appears on this exam is derived from the knowledge and skills statements and student expectations within the Texas-mandated standards, the Texas Essential Knowledge and Skills (TEKS). You can view the TEKS for this exam online via the following link: http://ritter.tea.state.tx.us/rules/tac/chapter111/ch111c.html#111.40 Refer to section (c), Knowledge and skills, 1A–8d. Throughout this guide, you'll see TEKS references. These refer to the numbers listed under (c) Knowledge and skills; for example, 1A or 3B.

## Materials Needed

You will need to bring a graphing calculator. The formula sheet at the end of this study guide will be provided during the exam. You can also bring this formula sheet with you to your exam. If you are taking a print exam, you must bring a #2 pencil to complete the exam. You will receive a computer-graded answer sheet when you arrive at the testing center. The proctor will provide scratch paper.

## Exam Structure

You will be allowed **3 hours** to complete this exam. The Algebra 2B exam consists of 71 multiple-choice questions that are equally weighted. The exam covers a wide variety of topics. To help you study, we have isolated 6 key topics and provided study tips and sample questions for each. You can expect several multiple-choice questions on each of the following topics:

**Topic 1:** Plan and Solve Real-world Problems
**Topic 2:** Graph Parent Functions and Inverse Functions
**Topic 3:** Exponential and Logarithmic Functions
**Topic 4:** Rational, Cubic, and Cube Root Functions
**Topic 5:** Operations on Rational Expressions, Polynomials, and Complex Numbers
**Topic 6:** Using Data

## Formula Chart

You will be provided with the formula chart at the end of this study guide. Familiarize yourself with these formulas and how to use them to solve problems based on the TEKS above.

## Scholastic Honesty

When you arrive at the testing center you will be asked to carefully read the exam rules and sign a statement agreeing to take the exam in accordance with the rules. This is called the Examinee's Certification. The following is a copy of these rules:

## Examinee's Certification

**This certification must be signed *before* the exam is administered and then returned with the completed examination attached, or credit for the exam will not be given.**

Scholastic dishonesty is a serious academic violation that will not be tolerated. Scholastic dishonesty encompasses, but is not limited to:

- copying from another student's work;
- using an unauthorized testing proctor or taking the exam at an unauthorized testing location;
- using materials not authorized by a testing proctor;
- possessing materials that are not authorized by a testing proctor, such as lessons, books, or notes;
- knowingly using or soliciting, in whole or Topic, the contents of an unadministered test;
- collaborating with or seeking aid from another student without authorization during the test;
- substituting for another person, or permitting another person to substitute for oneself, in taking a course test or completing any course-related assignment;
- using, buying, stealing, or transporting some or all of the contents of an unadministered test, test rubric, homework answer, or computer program.

**Evidence of scholastic dishonesty will result in a grade of *F* on the examination and an *F* in the course (if applicable).**

*At the testing center, you will be asked to sign a statement that says*
*you have read the above and agree to complete the examination with scholastic honesty.*

## General Study Tips
The bulleted lists and sample questions in this study guide can assist you in preparing for the exam. It is a fairly complete guide for studying, but does not cover every item on the test. Ultimately, you should use the TEKS to guide your exam preparation.

## Additional Study Tips
The following information provides direction for your studies. For each part, you will find study tips and sample questions to give you a general idea of the types of questions you can expect to see on the exam.

## Topic 1: Plan and Solve Real-world Problems
This is a broad topic that can relate to any type of question. Students should show the ability to create a plan for problem-solving, explain their reasoning, and solve problems arising in everyday life.

**Study Tips for Topic 1:**
This topic relates to TEKS 1A–1G. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:
- Solve word problems about the workplace and every day interactions in society
- Justify your solution to a problem
- Explain if a solution is or is not reasonable
- Create and use tables, graphs, number lines, Venn Diagrams and other representations to organize information

**Sample Questions for Topic 1:**
The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

**DIRECTIONS: Select the BEST responses to the following questions.**

1.  The climate of a tropical island averages a temperature of 87.8° Fahrenheit. For the past 100 years, it has never been more than 8.2° cooler or warmer than this average temperature. Which absolute value equation describes the minimum and maximum temperatures on this island for the past 100 years?

    A. $|x - 87.8| = 8.2$
    B. $|x + 87.8| = 8.2$
    C. $|x - 8.2| = 87.8$
    D. $|x + 8.2| = 87.8$

## Topic 2: Graph Parent Functions and Inverse Functions

This topic relates to your understanding of the basic shapes of graphs of square root, inverse, cubic, cube root, exponential, absolute value, and logarithmic functions. You are also expected to identify properties of these graphs, as well as to be able to compute and graph the inverses of these functions.

**Study Tips for Topic 2:**

This topic relates to TEKS 2A–2D. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:

- Graph the parent functions for square root, inverse, cubic, cube root, exponential, absolute value, and logarithmic functions
- Identify and analyze the domain, range, intercepts, asymptotic behavior, and maximum/minimum values
- Determine the inverse function and graph for the functions listed above
- Describe the relationship between a function and its inverse both graphically and numerically
- Use compositions of two functions to determine whether or not two functions are inverses

**Sample Questions for Topic 2:**
The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

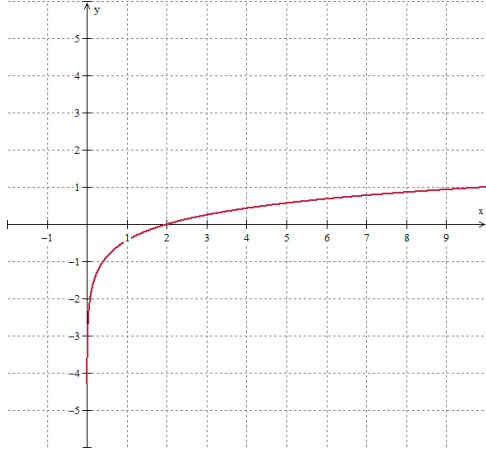**DIRECTIONS: Select the BEST responses to the following questions.**
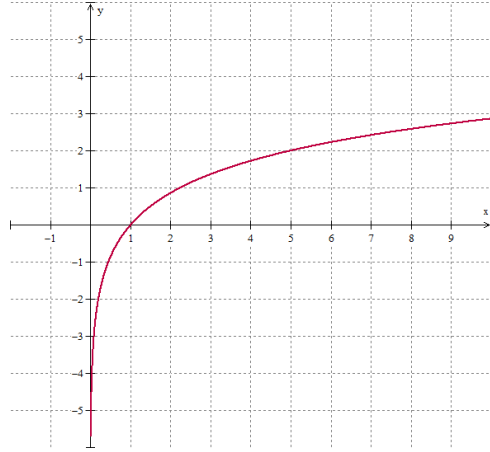
2.  Identify the function graphed below.
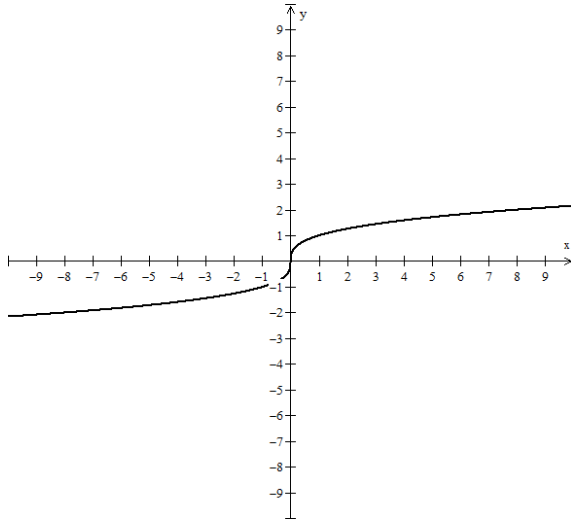


A.  cubic
B.  cube root
C.  square root
D.  absolute value

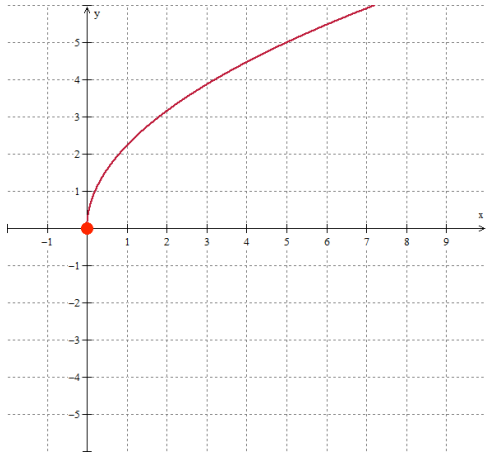3. Identify and graph the inverse function of $f(x) = 2 \cdot 5^x$.
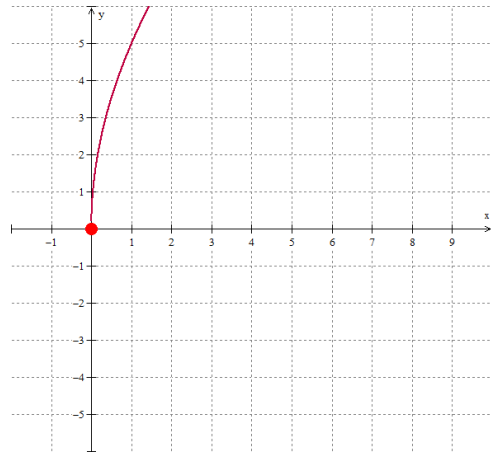
A. $f^{-1}(x) = \log_5\left(\dfrac{x}{2}\right)$



B. $f^{-1}(x) = \log_5\left(\dfrac{x}{2}\right)$



C. $f^{-1}(x) = \sqrt{5x}$



D. $f^{-1}(x) = \sqrt{5x}$

## Topic 3: Exponential and Logarithmic Functions

This topic relates to your understanding of the exponential and logarithmic parent functions. You are expected to understand the notation for various bases of each as well as how to use them to solve real-world problems.

**Study Tips for Topic 3:**

This topic relates to TEKS 5A–5E. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:

- Graph the logarithm parent functions $y = \log_2 x$, $y = \log x$, and $y = \ln x$
- Graph the exponential parent functions $y = 2^x$, $y = 10^x$, and $y = e^x$
- Graph and describe transformations of these functions
- Convert an expression/equation between its logarithmic and exponential equivalents
- Write exponential and logarithmic equations that represent real-world situations
- Solve logarithmic equations and exponential equations with real solutions
- Determine if a solution is reasonable

**Sample Questions for Topic 3:**

The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

**DIRECTIONS: Select the BEST responses to the following questions.**

4. The population of deer at a state park in 2015 was estimated to be 275 with an annual increase in population of 3.1%. Which equation best models this situation?

   A. $y = 275x^{3.1}$
   B. $y = 275 \cdot 3.1^x$
   C. $y = 275 \cdot 1.031^x$
   B. $y = 1.031 \cdot 275^x$

5. Which answer choice below does not contain a pair of equivalent equations?

   A. $\ln(x) = 2$ and $e^2 = x$
   B. $\log_5(x) = 2$ and $5^2 = x$
   C. $\log_2(x) = 5$ and $5^2 = x$
   D. $\log(x) = 2$ and $10^2 = x$

## Topic 4: Rational, Cubic, and Cube Root Functions

This topic relates to your understanding of the exponential and logarithmic parent functions. You are expected to understand the notation for various bases of each, as well as how to use them to solve real-world problems.

**Study Tips for Topic 4:**

This topic relates to TEKS 6A, 6B and 6G–6L. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:

- Graph the parent functions $y = x^3$ and $y = \sqrt[3]{x}$ and graph and describe transformations of each
- Solve cube root equations that have real roots
- Graph the rational parent function $y = \dfrac{1}{x}$ and graph and describe transformations of each
- Write rational equations that model real-world problems
- Solve rational equations with real solutions and determine the reasonableness of these solutions
- Identify, describe, and determine the effect of asymptotes on the domain and range of rational functions
- Write and solve equations involving inverse variation

**Sample Questions for Topic 4:**

The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

**DIRECTIONS: Select the BEST responses to the following questions.**

6.  Solve the following cubic root equation:

$\sqrt[3]{x+7} - 5 = 3$.

A. $x = 124$
B. $x = -209$
C. $x = 505$
D. no real solution

7. Zack and Sarah play tennis every Tuesday. Zack has won 10 out of the last 12 matches. How many matches will Zack have to win in a row to improve his win percentage to 90%? Write and solve the rational equation that models this problem.

A. $\dfrac{10+m}{12}=0.9$. Zack needs to win 1 more game.

B. $\dfrac{10+m}{12}=0.9$. Zack needs to win 8 more games

C. $\dfrac{10+m}{12+m}=0.9$. Zack needs to win 1 more game.

D. $\dfrac{10+m}{12+m}=0.9$. Zack needs to win 8 more games.

## Topic 5: Operations on Rational Expressions, Polynomials, and Complex Numbers

This topic relates to your understanding of how to add subtract, multiply, divide, and simplify expressions that are rational, polynomials, or complex.

**Study Tips for Topic 5:**
This topic relates to TEKS 7A–7I. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:
- Add, subtract, and multiply complex numbers. To do this, you must be familiar with powers of $i$
- Add, subtract, and multiply polynomials
- Determine the quotient and remainder of polynomials of degree 3 and 4
- Determine the linear factors of degree

**Sample Questions for Topic 5:**
The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

**DIRECTIONS: Select the BEST responses to the following questions.**

8. Determine the linear and/or quadratic factors, if any, of: $x^4 + 2x^3 - 3x^2$.

A. $x^2$ and $x + 1$
B. $x^2$ and $(x + 1)^2$
C. $x^2$, $x - 1$, and $x + 3$
D. There are no factors

9. Simplify: $(-2i + 4)(17i)$

    A. $34i$
    B. $102i$
    C. $34 + 68i$
    D. $-34 + 68i$

## Topic 6: Using Data

This topic relates to your understanding of how to analyze data, and how to generate an equation to use as a problem solving model.

**Study Tips for Topic 5:**
This topic relates to TEKS 8A–8D. Familiarize yourself with those TEKS, and then be prepared to demonstrate knowledge of the following topics:
- Analyze data to determine if it fits best a linear, quadratic or exponential model
- Use the regression feature on your graphing calculator to determine the best fit equation for a set of data
- Make predictions and decisions to solve problems by using the equation you created as a model

**Sample Questions for Topic 5:**
The following are sample questions. You can find the correct answers listed after the questions, but try answering the questions without looking at the answers first to check your comprehension.

**DIRECTIONS: Select the BEST responses to the following questions.**

10. The data below depicts the size of a sample of bacteria that was being studied in a lab over time. Use regression technology to determine the equation that best fits the data, and use it to predict the approximate time it would take to reach 5,000 bacteria in the sample.

| Time in Minutes ($x$) | Number of Bacteria ($y$) |
|:---:|:---:|
| 0 | 219 |
| 2 | 251 |
| 4 | 287 |
| 6 | 329 |
| 8 | 376 |

    A. $y = 219 \cdot 1.07^x$ and about 75 minutes
    B. $y = 219 \cdot 1.07^x$ and about 47 minutes
    C. $y = 0.64x^2 + 14.46x + 219$ and about 75 minutes
    D. $y = 0.64x^2 + 14.46x + 219$ and about 47 minutes

## Answer Key

| Item Number | Correct Answer | TEKS expectation |
|:---:|:---:|:---:|
| 1 | A | 1D, 1G |
| 2 | B | 2A |
| 3 | A | 2B |
| 4 | C | 5B |
| 5 | C | 5C |
| 6 | C | 6B |
| 7 | D | 6H, 6I |
| 8 | C | 7D, 7E |
| 9 | C | 7A |
| 10 | B | 8B, 8D |

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# Algebra 2
# Formula Sheet

## Factoring

| | |
|---|---|
| Perfect square trinomials | $a^2 - 2ab + b^2 = (a - b)^2$ <br> $a^2 + 2ab + b^2 = (a + b)^2$ |
| Difference of squares | $a^2 - b^2 = (a + b)(a - b)$ |
| Sum of cubes | $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ |
| Difference of cubes | $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ |

## Properties of Exponents

| | |
|---|---|
| Product of powers | $a^m a^n = a^{(m+n)}$ |
| Quotient of powers | $\dfrac{a^m}{a^n} = a^{(m-n)}$ |
| Power of a power | $(a^m)^n = a^{mn}$ |
| Rational exponent | $a^{m/n} = \sqrt[n]{a^m}$ |
| Negative exponent | $a^{-n} = \dfrac{1}{a^n}$ |

## Quadratic Equations

| | |
|---|---|
| Parabola | $(x - h)^2 = 4p(y - k)$ <br> $(y - k)^2 = 4p(x - h)$ |
| Standard form | $f(x) = ax^2 + bx + c$ |
| Vertex form | $f(x) = a(x - h)^2 + k$ |
| Quadratic formula | $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |
| Axis of symmetry | $x = \dfrac{-b}{2a}$ |