

2012-13 ATI-CAS Comprehensive Math Algebra II*Comprehensive Benchmark Assessment Series*

Instructions: It is time to begin. The scores of this test will help teachers plan lessons. Carefully, read each item in the test booklet. Select the best answer: A, B, C, or D. Use a pencil. Mark your answer on the ANSWER SHEET. Fill in the bubble next to your answer choice. Make sure the bubble is completely colored. Erase any extra pencil lines or changed answers. You may write on the test booklet unless your teacher gave you scratch paper. Review and check your answers after you have finished the test.



©Assessment Technology, Incorporated 2012 All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission from the publisher. Printed in the U.S.A.

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1a.i Explain that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range. (CCSS: F-IF.1)

- 1) What are the domain and range of the function $f(x) = -|x - 3| + 2$?
- A) Domain: all numbers less than or equal to 2; Range: all real numbers
 - B) Domain: all numbers greater than or equal to 2; Range: all real numbers
 - C) Domain: all real numbers; Range: all numbers greater than or equal to 2
 - ✓ D) Domain: all real numbers; Range: all numbers less than or equal to 2

CO-HS.PFA.1a.ii Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (CCSS: F-IF.2)

- 2) If $g(x) = 3|x - 2| - x$, what is $g(0.5)$?
- A) -5
 - B) -2
 - C) 1
 - ✓ D) 4

CO-HS.PFA.1a.iii Demonstrate that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (CCSS: F-IF.3)

- 3) Which function created the following sequence?

3, 3, 7, 15, ...

- A) $f(n) = 3n^2 - 7n + 7$
- B) $f(n) = n^2 - 3n + 5$
- C) $f(n) = 3n^2 - 9n + 9$
- ✓ D) $f(n) = 2n^2 - 6n + 7$

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1a.iii Demonstrate that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (CCSS: F-IF.3)

4) Which function created the following sequence?

11, 14, 19, 26, ...

- A) $f(n) = 3n + 8$
- B) $f(n) = 11n + 3$
- ✓ C) $f(n) = 10 + n^2$
- D) $f(n) = 6 + 6n - n^2$

CO-HS.PFA.1b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. * (CCSS: F-IF.4)

5) Which function has a maximum value of 10?

- A) $y = 10 + x^2$
- ✓ B) $y = 10 - x^2$
- C) $y = x^2 + 10x$
- D) $y = x^2 - 10x$

CO-HS.PFA.1b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. * (CCSS: F-IF.4)

6) Which function has an x-intercept of 7?

- A) $y = 7 + x^2$
- B) $y = 7 - x^2$
- ✓ C) $y = \sqrt{7} - \sqrt{x}$
- D) $y = \sqrt{7} + \sqrt{x}$

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. * (CCSS: F-IF.4)

7) Which function has a minimum value of 0?

- A) $y = -x^3$
- B) $y = x^3$
- C) $y = -x^4$
- ✓ D) $y = x^4$

CO-HS.PFA.1b.i For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. * (CCSS: F-IF.4)

8) Which function has a y-intercept of -3?

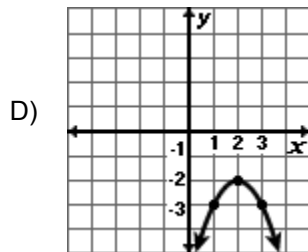
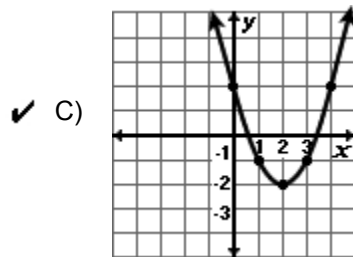
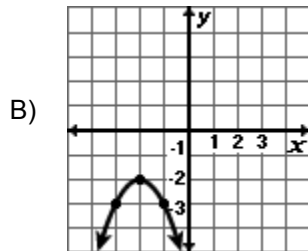
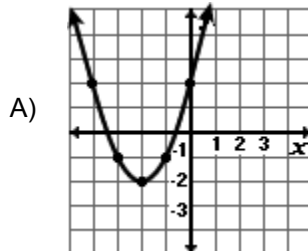
- A) $y = (x - 3)^5$
 - ✓ B) $y = x^5 - 3$
 - C) $y = (-3x)^5$
 - D) $y = -3x^5$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1c.ii Graph linear and quadratic functions and show intercepts, maxima, and minima. (CCSS: F-IF.7a)

9) Which is the graph of the following function?

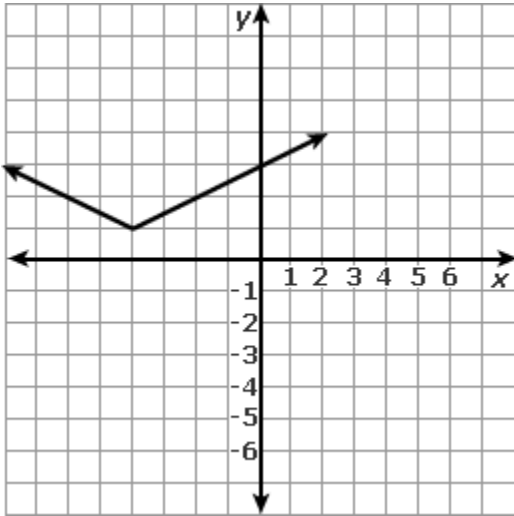
$$y = (x - 2)^2 - 2$$



2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1c.iii.Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (CCSS: F-IF.7b)

10) Which function is represented by the graph below?



A) $y = |x + 4| + 1$

✓ B) $y = \begin{cases} -\frac{1}{2}x - 1, & x \leq -4 \\ \frac{1}{2}x + 3, & x > -4 \end{cases}$

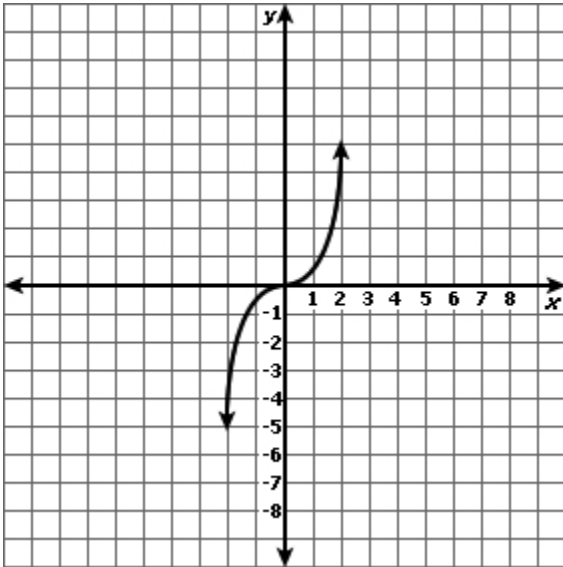
C) $y = 2|x - 1| - 4$

D) $y = \begin{cases} -2x - 7, & x \leq 1 \\ 2x + 9, & x > 1 \end{cases}$

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1c.iv Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. (CCSS: F-IF.7c)

11) Which function is represented by the graph below?

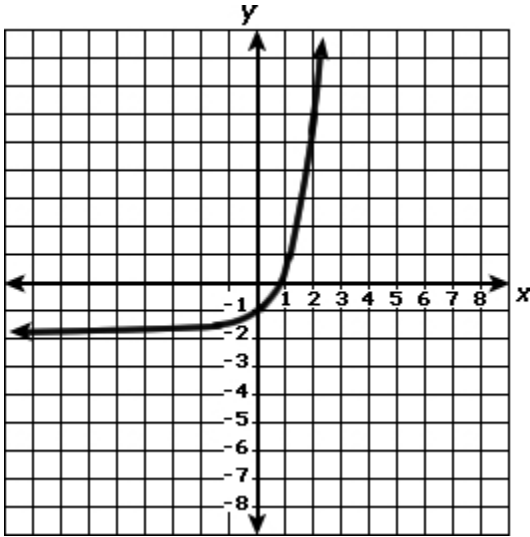


- A) $y = x^3$
 - B) $y = \frac{1}{2}x^5$
 - C) $y = x^5$
 - ✓ D) $y = \frac{1}{2}x^3$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1c.v Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. (CCSS: F-IF.7e)

- 12) Which function is represented by the graph below?



- ✓ A) $y = e^x - 2$
B) $y = e^x + 2$
C) $y = 2 - e^x$
D) $y = -2 - e^x$

CO-HS.PFA.1d.i Write a function that describes a relationship between two quantities. * (CCSS: F-BF.1)

- 13) Every day commuting to and from work, Jay drives his car a total of 45 miles. His car already has 2,700 miles on it.

Which function shows the total number of miles Jay's car will have been driven after n more days?

- A) $d(n) = 60$
B) $d(n) = 60n$
C) $d(n) = 45 + 2,700n$
✓ D) $d(n) = 2,700 + 45n$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1d.i.2 Combine standard function types using arithmetic operations. (CCSS: F-BF.1b)

14) Which expression represents $f(x) - g(x)$ if $f(x) = 2x^2 - 3x + 4$ and $g(x) = x^2 - 4x - 5$?

- A) $x^2 - 7x - 1$
- B) $x^2 - 7x + 9$
- C) $x^2 + x - 1$
- ✓ D) $x^2 + x + 9$

CO-HS.PFA.1d.i.2 Combine standard function types using arithmetic operations. (CCSS: F-BF.1b)

15) Which expression represents $f(x) + g(x)$ if $f(x) = 2x^2 + 3x + 4$ and $g(x) = -x^2 - 4x - 1$?

- A) $x^2 - x + 2$
 - ✓ B) $x^2 - x + 3$
 - C) $x^2 + x + 3$
 - D) $3x^2 + 7x + 5$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1d.ii Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. * (CCSS: F-BF.2)

16) What is the rule for the n th term of the sequence given below?

$1, 2, 3, 4, \dots, a_n, \dots$

- A) $a_n = n$
- B) $a_n = 2n$
- C) $a_n = 2n + 1$
- D) $a_n = 3n$

CO-HS.PFA.1e.i Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k , and find the value of k given the graphs. (CCSS: F-BF.3)

17) Which of the following most accurately describes the translation of the graph

$y = -2(x - 6)^2 - 1$ to the graph of

$y = -2(x - 4)^2$?

- A) up 1 and 2 to the right
 - B) up 1 and 2 to the left
 - C) down 1 and 2 to the right
 - D) down 1 and 2 to the left
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1e.i Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k , and find the value of k given the graphs. (CCSS: F-BF.3)

- 18) Which best describes how the graph will be affected when the quadratic equation

$$y = 3x^2 + 5 \text{ is changed to } y = 3x^2 - 2?$$

- A) The graph moves up 7.
- B) The graph moves down 2.
- ✓ C) The graph moves down 7.
- D) The graph moves up 5.

CO-HS.PFA.1e.iii Find inverse functions. (CCSS: F-BF.4)

- 19) Which function is the inverse of

$$f(x) = x^3 - 6?$$

- A) $f^{-1}(x) = x^3 + 6$
- B) $f^{-1}(x) = \sqrt[3]{x} + 6$
- C) $f^{-1}(x) = \sqrt[3]{x} - 6$
- ✓ D) $f^{-1}(x) = \sqrt[3]{x + 6}$

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.1e.iii Find inverse functions. (CCSS: F-BF.4)

20) Which function is the inverse of

$$f(x) = \frac{1}{2}x - 4 ?$$

- A) $f^{-1}(x) = \frac{1}{2}x + 2$
 - B) $f^{-1}(x) = \frac{1}{2}x + 4$
 - C) $f^{-1}(x) = 2x + 4$
 - ✓ D) $f^{-1}(x) = 2x + 8$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.2a.i Distinguish between situations that can be modeled with linear functions and with exponential functions. (CCSS: F-LE.1)

- 21) The returns on four investments are shown below. Which investment returns follow an exponential pattern?

Investment A

A)

Year	1	2	3	4
Return	\$400	\$500	\$750	\$1,000

Investment B

✓ B)

Year	1	2	3	4
Return	\$400	\$600	\$900	\$1,350

Investment C

C)

Year	1	2	3	4
Return	\$400	\$750	\$1,100	\$1,450

Investment D

D)

Year	1	2	3	4
Return	\$400	\$800	\$1,200	\$1,600

CO-HS.PFA.2a.iii Use graphs and tables to describe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. (CCSS: F-LE.3)

- 22) Which statement best describes the growth of the functions $f(x) = 4^x$ and $g(x) = x^4$ after $x = 4$?
- ✓ A) $f(x)$ grows faster than $g(x)$.
 - B) $g(x)$ grows faster than $f(x)$.
 - C) Both $f(x)$ and $g(x)$ grow at the same rate.
 - D) $f(x)$ grows faster than $g(x)$ until $x = 8$, where $g(x)$ begins to grow faster than $f(x)$.

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.2d.i Analyze* the impact of interest rates on a personal financial plan (PFL)

- 23) Devon put \$700 in a bank account with an interest rate of 4% compounded annually. How much money will be in the account after 2 years, if no money is withdrawn?

- A) \$728.28
- B) \$756.00
- ✓ C) \$757.12
- D) \$1,372.00

CO-HS.PFA.1d.i.1 Determine an explicit expression, a recursive process, or steps for calculation from a context. (CCSS: F-BF.1a)

- 24) Since 2009, a city's population has decreased by 3% every year. Linda is writing an equation to model the decline in population from 2009 to the present year. What should she write in blank #2?

$$p = \left(\frac{\quad}{\#1} \right) \left(\frac{\quad}{\#2} \right)^{t-2009}$$

- A) the city's population in 2009
- B) the city's population in the present year
- C) 0.03
- ✓ D) 0.97

CO-HS.PFA.2d.ii Evaluate* the costs and benefits of credit (PFL)

- 25) Your credit card company charges 12.5% interest compounded monthly with no additional fees. If you charge \$1,200 and don't make any payments or additional purchases, how much money will you owe the company in 6 months?

- A) \$2,432.74
- B) \$1,358.89
- ✓ C) \$1,276.98
- D) \$1,212.50

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3a.ii Use the structure of an expression to identify ways to rewrite it. (CCSS: A-SSE.2)

26) $36x^2 + 84xy + 49y^2 =$

- A) $(6x + 7y)(6x - 7y)$
 - B) $(12x + 7y)(3x + 7y)$
 - ✓ C) $(6x + 7y)^2$
 - D) $(6x - 7y)^2$
-

CO-HS.PFA.3a.ii Use the structure of an expression to identify ways to rewrite it. (CCSS: A-SSE.2)

27) $16x^2 - 24x + 9 =$

- A) $(8x - 3)(2x - 3)$
 - B) $(4x + 3)^2$
 - C) $(4x + 3)(4x - 3)$
 - ✓ D) $(4x - 3)^2$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3b.i.1 Factor a quadratic expression to reveal the zeros of the function it defines. (CCSS: A-SSE.3a)

28) If the area of a rectangle is represented by $x^2 - 5x + 6$, what is the length of the rectangle, if the width is $x - 3$?

✓ A) $x - 2$

B) $x + 2$

C) $x + 3$

D) $x - 3$

CO-HS.PFA.3b.ii Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. ? (CCSS: A-SSE.4)

29) What is the sum of the first 10 terms of the geometric series below?

$$1 + 2 + 4 + 8 + \dots$$

A) 511

B) 512

✓ C) 1023

D) 1024

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3c.i Explain that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (CCSS: A-APR.1)

30) $(6x^2 + 3x + 10) - 4(x^2 - 4x + 6) =$

- A) $2x^2 - 13x + 34$
- ✓ B) $2x^2 + 19x - 14$
- C) $2x^2 + 13x - 14$
- D) $2x^2 + 19x + 34$

CO-HS.PFA.3c.i Explain that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (CCSS: A-APR.1)

31) Which of the following expressions is equivalent to the one shown below?

$$(2x^2 + 3x - 1)(x + 2) =$$

- A) $2x^3 + x^2 + 5x - 2$
 - B) $2x^3 + 7x^2 + 5x + 2$
 - ✓ C) $2x^3 + 7x^2 + 5x - 2$
 - D) $2x^3 + x^2 + 5x + 2$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3d.i State and apply the Remainder Theorem. (CCSS: A-APR.2)

32) If dividing the polynomial $f(x)$ by $(x + 4)$ yields a remainder of -11 , which of the following is true?

- A) $f(-11) = -4$
- B) $f(-11) = 4$
- ✓ C) $f(-4) = -11$
- D) $f(4) = -11$

CO-HS.PFA.3d.i State and apply the Remainder Theorem. (CCSS: A-APR.2)

33) If $f(x)$ is divided by $x - 2$, what is the value of the remainder?

$$f(x) = x^3 - 6x^2 - 7x + 60$$

- ✓ A) 30
- B) 12
- C) -42
- D) -72

CO-HS.PFA.3d.i State and apply the Remainder Theorem. (CCSS: A-APR.2)

34) If $x = 6$, the value of the polynomial below is 8. Based on this fact, which statement is correct?

$$x^2 - 18x + 80$$

- A) $(x + 6)$ is a factor of the polynomial.
 - ✓ B) $(x - 6)$ is NOT a factor of the polynomial.
 - C) $(x + 8)$ is a factor of the polynomial.
 - D) $(x - 8)$ is NOT a factor of the polynomial.
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3d.ii Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (CCSS: A-APR.3)

- 35) The graph of a polynomial function has the following x-intercepts: -3, 1, 4. Which of these expressions represents such a function?

- ✓ A) $(x - 1)(x + 3)(x - 4)$
- B) $(x + 1)(x - 3)(x + 4)$
- C) $(x + 1)(-3x + 1)(4x + 1)$
- D) $(x - 1)(-3x - 1)(4x - 1)$

CO-HS.PFA.3d.ii Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (CCSS: A-APR.3)

- 36) The graph of a polynomial function has the following x-intercepts: 0, 1, 3, 6. Which of these expressions represents such a function?

- A) $(x - 1)(x - 3)(x - 6)$
- B) $x(x + 1)(x + 3)(x + 6)$
- C) $(x + 1)(3x + 1)(6x + 1)$
- ✓ D) $2x(x - 1)(x - 3)(x - 6)$

CO-HS.PFA.3d.ii Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. (CCSS: A-APR.3)

- 37) The graph of a polynomial function has the following x-intercepts: -9, 5.

Which of these expressions represents such a function?

- A) $5x - 9$
 - B) $9x - 5$
 - ✓ C) $(x - 5)(x + 9)$
 - D) $(x + 5)(x - 9)$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3g Rewrite simple rational expressions in different forms. (CCSS: A-APR.6)

38) Which of the following expressions is equivalent to the one shown below?

$$\frac{24x^2 - 12x + 8}{4x}$$

- ✓ A) $6x - 3 + \frac{2}{x}$
- B) $6x + 3 + \frac{2}{x}$
- C) $6x - 3 + 2x$
- D) $6x + 3 + 2x$

CO-HS.PFA.3g Rewrite simple rational expressions in different forms. (CCSS: A-APR.6)

39) Which of the following expressions is equivalent to the one shown below?

$$\frac{x^2 - 3x}{x^3 + x^2 - 12x}$$

- ✓ A) $\frac{1}{x+4}$, where $x \neq 0, 3, -4$
- B) $\frac{1}{x+4}$, where $x \neq 3, -4$
- C) $\frac{x}{x+4}$, where $x \neq 3, -4$
- D) $\frac{1}{x-4}$, where $x \neq 0, -3, 4$

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.3g Rewrite simple rational expressions in different forms. (CCSS: A-APR.6)

- 40) Which of the following expressions is equivalent to the one shown below?

$$\frac{24p - 42}{-6}$$

- A) $-4p - 42$
- ✓ B) $-4p + 7$
- C) $4p - 7$
- D) $18p - 48$

CO-HS.PFA.4a.iv Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (CCSS: A-CED.4)

- 41) The distance between two points can be described by the following formula, where d = distance, (x_1, y_1) = starting point, and (x_2, y_2) = terminal point.

What is the equivalent equation solved for x_2 , when $x_2 \geq x_1$?

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- A) $x_2 = x_1 + d - (y_2 - y_1)$
 - ✓ B) $x_2 = x_1 + \sqrt{d^2 - (y_2 - y_1)^2}$
 - C) $x_2 = y_1 + \sqrt{d^2 - (x_2 - x_1)^2}$
 - D) $x_2 = x_1 + \sqrt{(y_2 - y_1)^2 - d^2}$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.4b.ii Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. (CCSS: A-REI.2)

42) What is the solution of the following equation?

$$\frac{2}{x+1} + \frac{x}{x-1} = \frac{2}{x^2-1}$$

- A) $x = 4$
- ✓ B) $x = -4$
- C) $x = -4, 1$
- D) $x = 1$

CO-HS.PFA.4c.ii.3 Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b . (CCSS: A-REI.4b)

43) What are the solutions to the equation below?

$$3x^2 - 2x + 2 = 0$$

- A) $x = \frac{1}{3}(1 \pm i\sqrt{10})$
 - ✓ B) $x = \frac{1}{3}(1 \pm i\sqrt{5})$
 - C) $x = \frac{1}{3}(1 \pm 2i\sqrt{10})$
 - D) $x = \frac{1}{3}(1 \pm 2i\sqrt{5})$
-

2012-13 ATI-CAS Comprehensive Math Algebra II

CO-HS.PFA.4d.ii Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. (CCSS: A-REI.6)

44) What is the solution to this system of equations?

$$\begin{cases} x - 2y + 3z = 7 \\ 2x + y + z = 4 \\ -3x + 2y - 2z = -10 \end{cases}$$

- A) $(2, 1, -1)$
- ✓ B) $(2, -1, 1)$
- C) no solution
- D) infinitely many solutions

CO-HS.PFA.4d.ii Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. (CCSS: A-REI.6)

45) What is the value of y in the solution of the following system of equations?

$$\begin{cases} -2x + 4y + 3z = 8 \\ 3x + 5y + z = -1 \\ 4x - 2y - z = -6 \end{cases}$$

- A) -1
- ✓ B) 0
- C) 1
- D) 2

2012-13 ATI-CAS Comprehensive Math Algebra II

Instructions for Student-Read Offline Assessments

Teacher Instructions:

This test packet includes:

- 1) test booklets
- 2) student answer sheets containing student and test identification information

As soon as you receive your test materials, confirm that you have enough testing materials for each student in your class.

You may provide students with scratch paper or students may write in the test booklet.

Allow a few minutes at the beginning of the testing period to review the assessment instructions with students. Students should work through the test items in the test booklet, marking their responses on the answer sheet provided to them. You may answer student questions about the test instructions. Do not answer questions related to the content of the test itself. This includes translating, rephrasing, or adding information to the test question, answers, or related content.

Once the assessment period is over, collect the students' test booklets and answer sheets. Provide to assigned district staff the answer sheets for scanning and the test booklets for proper disposal.