Student Name: _____

Missouri

DEPARTMENT OF ELEMENTARY & SECONDARY

EDUCATION ™

End-of-Course Assessment

Algebra II

Pre-Test

Directions to the Student

Today you will be taking Session I of the Missouri Algebra II Test. This is a test of how well you understand the course level expectations for Algebra II.

There are several important things to remember:

1 Read each question carefully and think about the answer. Then choose the answer that you think is best.

2 Make sure you clearly mark the correct choice in your test book.

3 If you do not know the answer to a question, skip it and go on. You may return to it later if you have time.

4 If you finish the test early, you may check over your work.

1. Which of the following is the simplified expression of $2\sqrt{-16} + \sqrt{225}$ in standard form, $a + bi$?

   A. $15 + 4i$

   B. $15 - 4i$

   C. $15 + 8i$

   D. $15 - 8i$

2. **The student council at a high school placed a box in the cafeteria where students could vote for which of three specialty lunch days would be the most popular: Mac & Cheese Monday, Taco Tuesday, or Fish Friday. More than twice as many students voted for Mac & Cheese Monday than the second-place choice Taco Tuesday. Chelsea asked the students at her table which choice they voted for. All but one student said they voted for Taco Tuesday. The other student voted for Fish Friday.**
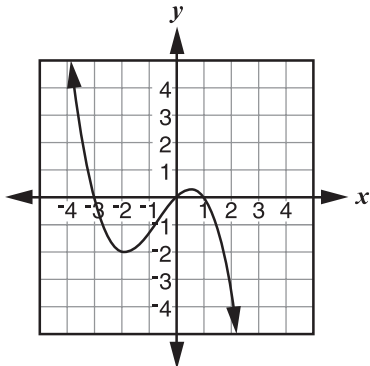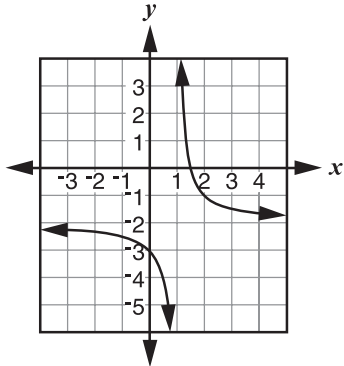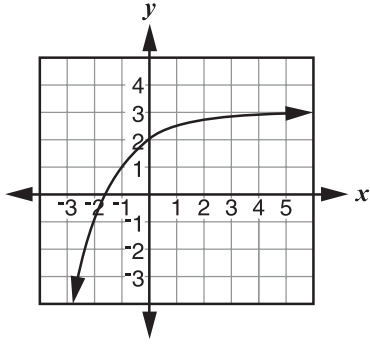
What is the <u>most likely</u> reason for the difference between the student council's results and Chelsea's?

A. Both survey methods were biased so a difference between the results is understandable.

B. Both the student council and Chelsea collected data in an unbiased sample. Random variation between the two samples accounts for the different results.

C. The student council's method was biased because students could vote multiple times. Chelsea's method was unbiased and represented the school's population better.

D. Chelsea influenced the students at her table into choosing the option she preferred, and the student council's box was taken over by people that really liked Mac & Cheese.

3. Classify each function as either an exponential, polynomial, or rational function.

    Select the correct boxes.

	Exponential	Polynomial	Rational
$f(x) = x^3$			
$f(x) = 3x$			
$f(x) = \dfrac{x + 1}{x - 3}$			

4. **Rewrite the exponential equation $5^x = 20$ into an equivalent logarithmic equation.**

Fill in each box with the correct letter of the answer choice.

$$\log \boxed{}\boxed{} = \boxed{}$$

A. x

B. 20

C. 4

D. 5

5. Factor each polynomial completely. Draw a line from each polynomial on the left to the corresponding factored form on the right.

$4(x - 2)(x + 2)$

$(x + 5)(x - 5)$

$x^2 + 25$

$(x - 3)\left(x + \frac{3}{2} + \frac{3\sqrt{3}}{2}i\right)\left(x + \frac{3}{2} - \frac{3\sqrt{3}}{2}i\right)$

$4x^2 - 16$

$(2x + 1)(3x - 5)$

$6x^2 + 7x - 5$

$(x + 5i)(x - 5i)$

$(2x - 1)(3x + 5)$

$x^3 - 27$

$4(x^2 - 4)$

$(x - 3)^3$

6. Draw a line from each function on the left to the equivalent form of the function on the right. Not all functions on the right side will be used.

○ $y = x^2 - 2x - 24$

$y = (x - 6)(x + 4)$ ○   ○ $y = (x + 12)(x + 2)$

$y = (x - 5)^2 - 49$ ○   ○ $y = x^2 - 24$

$y = x^2 + 2x - 24$ ○   ○ $y = (x + 1)^2 - 25$

○ $y = (x - 12)(x + 2)$

Go On ▶

7. Condense the following expression into a single term using properties of logarithms.

$$2\log_3 x + 3\log_3 y - 5\log_3 z$$

Which single term is equivalent to the expression?

A. $\log_3 = \left(\dfrac{x^2 y^3}{z^5}\right)$

B. $\log_3 = \left(\dfrac{6xy}{5z}\right)$

C. $\log_3 = (2x + 3y - 5z)$

D. $\log_3 = \left(\dfrac{2x + 3y}{5z}\right)$

8. **Simplify the following rational expression completely:**

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

Enter the simplified answer in the box.

9.   All functions of form $f(x) = x^n$, where n is an integer, can be graphed on a Cartesian coordinate plane.

Function transformations are listed in the first column of the table. Transformed functions are listed in the top row.

Select the box or boxes that match each function with the transformation that took place.

	$g(x) = -(x - h)^n$	$j(x) = ax^n + k$	$m(x) = (x + h)^n - k$
Reflection across the x-axis			
Translation of h units to the left			
Translation of k units up			
Vertical dilation			

10. Draw a line from each rational expression on the left to its equivalent radical expression on the right.

○ $\sqrt[3]{x}$

$25^{\frac{1}{2}}$ ○ ○ 5

$4x^{\frac{2}{3}}$ ○ ○ $\sqrt[3]{4x^2}$

$x^{\frac{1}{3}}$ ○ ○ $\sqrt{5}$

○ $4\sqrt[3]{x^2}$

○ x^3

Go On ▶

11. The graph below is of a polynomial function $y = f(x)$.
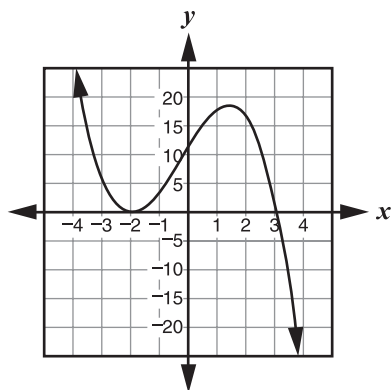
Which of the following is the **most likely** factorization of $f(x)$?

A. $f(x) = (x - 2)^2(x + 3)$

B. $f(x) = (x + 2)^2(x - 3)$

C. $f(x) = -(x - 2)^2(x + 3)$

D. $f(x) = -(x + 2)^2(x - 3)$

12. What is the inverse function for $f(x) = \frac{1}{2}\log_5(x)$?

A. $f^{-1}(x) = \frac{1}{2} \cdot 5^x$

B. $f^{-1}(x) = 2 \cdot 5^x$

C. $f^{-1}(x) = 10^x$

D. $f^{-1}(x) = 25^x$

13. A total of 150 students have taken an Algebra II final exam. The scores are normally distributed with a mean of 71% and a standard deviation of 6%. How many students would you expect to have scored between 65% and 77%?

    A. 51

    B. 68

    C. 102

    D. 142

14. Select the box that matches the standard form of each quadratic equation to its corresponding vertex form.

	$y = x^2 + 6x + 13$	$y = x^2 - 6x + 13$	$y = x^2 + 6x + 5$	$y = x^2 - 6x + 5$
$y = (x - 3)^2 + 4$				
$y = (x - 3)^2 - 4$				
$y = (x + 3)^2 + 4$				
$y = (x + 3)^2 - 4$				

Go On ▶

15. Which of the following expressions are solutions for x in the equation $4^x = 12$? Select <u>all</u> that apply.

A. $\dfrac{\log 4}{\log 12}$

B. $\dfrac{\log 12}{\log 4}$

C. $\dfrac{\ln 4}{\ln 12}$

D. $\dfrac{\ln 12}{\ln 4}$

E. $\log_4(12)$

F. $\log_{12}(4)$

16. Which are factors of the polynomial $p(x) = x^3 + 5x^2 + 2x - 8$? Select all that apply.

A. $(x - 4)$

B. $(x - 2)$

C. $(x - 1)$

D. $(x + 1)$

E. $(x + 2)$

F. $(x + 4)$

17. The following question has two parts. First, answer Part A. Then, answer Part B.

Part A

Which of the following is the inverse of $f(x) = \frac{1}{2}x - 6$?

A. $f^{-1}(x) = -\frac{1}{2}x + 6$

B. $f^{-1}(x) = \frac{1}{2}x + 6$

C. $f^{-1}(x) = 2x - 12$

D. $f^{-1}(x) = 2x + 12$

Part B

What is the result when the two functions are composed, $f(f^{-1}(x))$?

Enter your answer in the box.

$f(f^{-1}(x)) = $ ⬚

18. For the polynomial function $f(x) = x^3 + 5x^2 + 9x + 45$, select the values that correctly complete each statement.

The polynomial has ____ total zeros.

     ○ 3

     ○ 2

     ○ 1

     ○ 0

The polynomial has ____ real zeros.

     ○ 3

     ○ 2

     ○ 1

     ○ 0

The polynomial has ____ non-real zeros.

     ○ 3

     ○ 2

     ○ 1

     ○ 0

19. In chemistry, the pH of a solution is a measure of its acidity. If a solution has a pH of 7, it is considered neutral. If its pH is lower than 7, it is acidic; if higher, it is basic. The table below describes the relationship between the pH and the concentration of the hydronium ion, [H⁺].

	pH	[H+] Concentration	
acid	0	1.E+00	1
	1	1.E–01	0.1
	2	1.E–02	0.01
	3	1.E–03	0.001
	4	1.E–04	0.0001
	5	1.E–05	0.00001
	6	1.E–06	0.000001
neutral	7	**1.E–07**	**0.0000001**
base	8	1.E–08	0.00000001
	9	1.E–09	0.000000001
	10	1.E–10	0.0000000001
	11	1.E–11	0.00000000001
	12	1.E–12	0.000000000001
	13	1.E–13	0.0000000000001
	14	1.E–14	0.00000000000001

Select the choices that correctly complete the sentence.

The concentration of [H⁺] in a solution is 0.000038.

This solution is ____ and its pH level is between ____ .

    ○ acidic   ○ 3 and 4

    ○ basic   ○ 4 and 5

                         ○ 5 and 6

20. Perform the given operation. Draw lines from the algebraic expressions to form the simplified rational expression.

$$\frac{x^3 + 2x^2 - 9x - 18}{x^2 - 4} \div \frac{x^2 - 3x}{x - 2} = \frac{\text{numerator}}{\text{denominator}}$$

x

$x + 2$

$x - 2$

$x + 3$

$x - 3$

Numerator

Denominator

21. At present, there are 450 NBA players. The mean height of these players is 6'7", and the height is normally distributed. What is the approximate number of players whose height would be within one standard deviation $\left(3\frac{1}{2}"\right)$ of the mean?

A. 68 players

B. 95 players

C. 306 players

D. 427 players

22. **Given the system of inequalities below, draw a line from the coordinate points into the column that best represents each pair.**

$$\begin{cases} y \geq x^2 + x - 2 \\ y < -x + 1 \end{cases}$$

| (0, 0) | (0, 1) | (0, −2) | (1, 0) | (1, 1) | (−3, 0) | (−3, 4) |

Point is a solution   **Point is not a solution**

23. Select <u>all</u> the expressions that are equivalent to $\sqrt[5]{32a^4b^{12}c^{-5}}$.

A. $6.4a^2c\sqrt[5]{a^4b^2}$

B. $\dfrac{2b^2\sqrt[5]{a^4b^2}}{c}$

C. $\dfrac{6.4a^{\frac{4}{5}}b^{\frac{12}{5}}}{c}$

D. $2a^{\frac{4}{5}}b^{\frac{12}{5}}c^{-1}$

E. $2b^2c\sqrt[5]{a^4b^2}$

F. $\dfrac{2a^{\frac{4}{5}}b^{\frac{12}{5}}}{c}$

24. Solve the following logarithmic equation for *x*:

$$\log_2(3x - 1) = 5$$

Enter the numeric value of *x* in the box.

25. Three high school students are trying to determine what proportion of households in their community recycle.

- Student A surveyed 25 of his family members and closest friends.

- Student B divided the community into 5 equivalent sections and randomly surveyed 5 households from each section.

- Student C surveyed the first 25 people who walk into the local mall.

Which data set is most reliable and why?

Select the choices that correctly complete the sentence.

Student _____ data set is most reliable

○ A's

○ B's

○ C's

because the student collected data from a _____ .

○ random sample

○ normal sample

○ carefully selected sample

26. What is the solution for the equation $\dfrac{2}{x^2 - x} = \dfrac{1}{x - 1}$?

Enter the answer in the box.

$x = $

27. Given $f(x) = x^2 + 8x - 20$ and $g(x) = 4x - 10$, what is $(f \circ g)(x)$?

   A. $4x^2 + 32x - 90$

   B. $16x^2 - 48x$

   C. $16x^2 + 32x - 200$

   D. $4x^3 + 22x^2 - 160x + 200$

28. **A city council is trying to pass a new proposition to increase funding for the local schools. In order to pass the proposition, they will need over 50% of the votes in the upcoming election. A poll of a random sample of 600 resident voters was conducted, and 52% of those residents support the new budget.**

    The margin of error in the poll is ±4%. Should the city council strongly believe that the new budget will be approved?

    A. No, the confidence interval includes values that are less than 50%.

    B. No, the margin of error is too high. There might have been a problem with the poll.

    C. Yes, the confidence interval includes values that are mostly greater than 50%.

    D. Yes, a 4% margin of error means that there is a 96% chance that the results are correct and 52% of voters will support the new proposition.

Go On ▶

29. Solve the logarithmic equation.

$$\log_5(2) + \log_5(x - 3) = 2\log_5(4)$$

Enter the answer in the box.

$X = $ ⬚

30. What is $(\sqrt{3} + 5)(\sqrt{2} + \sqrt{6})$ written in simplest form?

A. $6\sqrt{6} + \sqrt{18} + 5\sqrt{2}$

B. $\sqrt{6} + 5\sqrt{6}$

C. $5\sqrt{6} + 8\sqrt{2}$

D. $6\sqrt{6} + 8\sqrt{2}$

Go On ▶

31. Determine the least common multiple for the polynomials $x^2 + 7x + 6$, $x^2 - 1$, and $2x^2 + 9x - 18$.

Which are factors of the least common multiple? Select <u>all</u> that apply.

A. $(x + 1)$

B. $(x + 3)$

C. $(x + 6)$

D. $(x - 1)$

E. $(x - 3)$

F. $(2x - 3)$

32. Sound intensity (*I*) is measured in watts per meters squared $\left(\frac{W}{m^2}\right)$, and the loudness of the sound, *L*(*I*), which is measured in decibels (dB), is described by the function $L(I) = 10\log\left(\frac{I}{I_0}\right)$. A barely audible sound has intensity $I_0 = 10^{-12}\frac{W}{m^2}$.

Rounded to the nearest tenth of a decibel, what is the loudness, in decibels, of a musical group that plays with sound intensity of $I = 6.7 \times 10^{-3}\frac{W}{m^2}$?

A. 8.2

B. 9.8

C. 76.5

D. 98.3

STOP ●

Directions to the Student

Today you will be taking Session II of the Missouri Algebra II Test. This is a test of how well you understand the course level expectations for Algebra II.

There are several important things to remember:

1 Read the performance event carefully and think about how to answer the question.

2 Show all of the work that you did to answer the question with a number 2 pencil. If a box is provided, make sure all of your work is in the box. If a line is provided to write your answer on, be sure your answer is on the line.

3 If you do not know the answer to a question, skip it and go on. You may return to it later if you have time.

4 If you finish the test early, you may check over your work.

5 Write or mark your answers directly in your test book with a number 2 pencil.

Go On ▶

Corinne is planning to invest in a savings account and Sally intends to purchase a car. Help Corinne and Sally with their financial planning.

1. **The following question has two parts. First, answer Part A. Then, answer Part B.**

    For her birthday, Corinne's grandfather is giving her a choice of investment plans. She can choose either Plan X or Plan Y.

    Plan X: A single deposit of $500 is invested at 6% interest rate, compounded continuously.

    Plan Y: An annuity with a deposit of $5 per month is invested at an interest rate of 6% per year, compounded monthly.

    To determine the value of the account under Plan Y, use

    $$A = \frac{P\left(\left(1 + \frac{r}{12}\right)^{12t} - 1\right)}{\frac{r}{12}}$$

    , where *A* is the amount of money in the account, *P* is the monthly deposit, *r* is the interest rate, and *t* is the number of years.

Part A

After 7 years, how much money would each plan have? Enter the amounts, rounded to the nearest cent, in the boxes.

Plan X: $

Plan Y: $

Part B

How many years will it be before the amount of money in Plan Y exceeds the amount of money in Plan X? Select the number of years that correctly completes the sentence.

It will be _____ before the amount of money in Plan Y exceeds

○ 10 years

○ 12 years

○ 14 years

○ 16 years

the amount of money in Plan X.

Go On ▶

2. **The following question has two parts. First, answer Part A. Then, answer Part B.**

Part A

Corinne has $500 to invest. She wants to see how much money she would have at the end of 4 years if she invested her money in an account with a 6% interest rate. Rounded to the nearest cent, enter the amount of money each option would have at the end of 4 years in the boxes below.

Plan A—Compounded Annually: $

Plan B—Compounded Quarterly: $

Plan C—Compounded Monthly: $

Plan D—Compounded Continuously: $

Part B

Select the number of years that correctly completes the sentence.

It will take _____ for Corinne to double her investment if her

  ◯ 10 years

  ◯ 12 years

  ◯ 14 years

  ◯ 16 years

investment is compounded continuously.

3.   Sally is buying a car for $3,295. She has saved $900, but she must borrow money from her family for the remainder. Her family will loan her the remainder at 5% interest, compounded quarterly. She will not have to make payments for 2 years but will pay the entire loan in one lump sum.

Rounded to the nearest cent, how much money will she owe her family at the end of 2 years? Enter the amount owed in the box.

$ [   ]

When Sally pays back the loan at the end of 2 years, her family lets her keep the interest on the loan. Rounded to the nearest cent, enter the amount of money Sally will get to keep in the box.

$ [   ]