

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**COMMON ALGEBRAIC EXPRESSIONS**  
**COMMON CORE ALGEBRA II**



In Algebra II we will spend a lot of time evaluating and simplifying algebraic expressions. Just to be clear:

**ALGEBRAIC EXPRESSION**

**Algebraic expressions** are just combinations of constants and variables using the typical operations of addition, subtraction, multiplication, and division along with exponents and roots (square roots, cube roots, etcetera).

It is important to be able to evaluate algebraic expressions for values of the variables contained in them.

**Exercise #1:** Consider the algebraic expression  $4x^2 + 1$ .

(a) Describe the operations occurring within this expression and the order in which they occur.

(b) Evaluate this expression for the replacement value  $x = -3$ . Show each step in your calculation. Do not use a calculator.

**Exercise #2:** Consider the more complex algebraic expression (known as a rational expression)  $\frac{4x+3}{x^3-7}$ .

(a) Without using your calculator, find the value of this expression when  $x = 3$ . Reduce your answer to simplest terms. Show your steps.

(b) If a student entered the following expression into their calculator, it would give them the incorrect answer. Why?

$$4(3) + 3 / 3^3 - 7$$

Expressions can contain more complex operators, such as the square and cube roots as well as the absolute value. We will need each of these over the span of this course, so some practice with all of them is warranted.

**Exercise #3:** Is the absolute value expression  $|x-8|+2$  equivalent to  $|x|+10$ ? How can you check this?



**Exercise #4:** Consider the algebraic expression  $\sqrt{25-x^2}$ , which contains a square root.

- (a) Evaluate this expression for  $x = -3$ .                      (b) Why can you *not* evaluate the expression for  $x = 13$ ?

- (c) Max thinks that the square root operation distributes over the subtraction. In other words, he believes the following equation is an identity:

$$\sqrt{25-x^2} = 5-x$$

Show that this is **not** an **identity**.

Algebraic expressions can become quite complicated, but if you consider **order of operations** and work generally from **inside to outside** then you can evaluate any expression for replacement values.

**Exercise #5:** Consider the rather complicated expression  $\sqrt{\frac{|x-8|}{5x^2+4}}$ .

- (a) What operation comes last in this expression?                      (b) Evaluate the expression for  $x = 2$ . Simplify it completely.

**Exercise #6:** Which of the following is the value of  $\frac{|\sqrt{4x+9}-x^2|}{3}$  when  $x = 10$ ?

- (1) 31                                      (3) 18  
(2) 24                                      (4) 84



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**COMMON ALGEBRAIC EXPRESSIONS**  
**COMMON CORE ALGEBRA II HOMEWORK**

**FLUENCY**

1. Which of the following expressions has the greatest value when  $x=5$ ? Show how you arrived at your choice.

$2x^2 + 7$

$\frac{x^3 - 5}{3}$

$\frac{10x - 2}{x - 3}$

2. A **zero** of an expression is a value of the input variable that results in the expression having a value of zero (catchy and appropriate name). Is  $x=3$  a zero of the **quadratic expression** shown below? Justify your yes/no answer.

$$4x^2 - 8x - 12$$

3. Which of the following is the value of the **rational expression**  $\frac{2-3x^2}{6x+4}$  when  $x=-2$ ?

(1)  $-2\frac{1}{2}$

(3)  $1\frac{1}{4}$

(2)  $-\frac{5}{8}$

(4)  $\frac{2}{7}$

4. If  $x=5$  and  $y=-2$  then  $\frac{x+y}{x^2-y^2}$  is

(1)  $\frac{1}{7}$

(3)  $\frac{3}{29}$

(2)  $\frac{13}{3}$

(4)  $\frac{7}{19}$



5. What is the value of  $\left| |x-10| - |x+3| \right|$  if  $x = 2$ ?

(1) 7

(3) 3

(2) 5

(4) 17

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6. If  $x = 2$  then  $\frac{\sqrt{4x^2 + 2x + 5}}{10}$  has a value of

(1)  $\frac{5}{2}$

(3)  $\frac{2}{5}$

(2)  $\frac{7}{5}$

(4)  $\frac{1}{2}$

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### APPLICATIONS

7. The revenue, in dollars, that eMathInstruction makes off its videos in a given day depends on how many views they receive. If  $x$  represents the number of views, in hundreds, then the profit can be found with the expression:

$$\frac{1}{2}x^2 + 6x - 10$$

How much revenue would they make if their videos were viewed 600 times?

### REASONING

8. Sameer believes that the two expressions below are equivalent. Test values and see if you can build evidence for or against this belief.

$$(x-3)(x+8)$$

$$x^2 + 5x - 24$$

