Name:

Date:

Activity 3: Transition from Expressions to Equations

**Part I (with CAS): Introduction to the use of the SOLVE command**

Recall in our first activity on equivalence of expressions that we encountered expressions that were not equivalent (a reminder of the definition of equivalence: “If, for any admissible number that replaces *x*, each of the expressions gives the same value, we say that these expressions are equivalent on the set of admissible values.”).

With those non-equivalent expressions, when we entered into the CAS the equations formed with such expressions, the CAS did not display “true”. This was because there are only *some* (or *no*) values of x that, when substituted into both sides of the equation, produce equal results. In the present activity we will use the CAS to find the values of x that produce equal results for given expressions.

Here is an example of two expressions that are clearly not equivalent: *x*2 and *x.*

If we enter into the calculator an equation formed of these two expressions (*x*2= *x*), it will therefore not display “true”. To find those values of x for which the two expressions produce equal values, we can use the SOLVE command of the CAS.

**Syntax**: SOLVE (Expr1 = Expr2, x), presuming that “x” is the variable name that appears in each expression, and Expr1 and Expr2 represent the given expressions.

**Solve the equation *x*2= *x* using the SOLVE command in your CAS**.

1. What does the CAS display as a result?
2. Anticipate what the calculator would display were you to substitute each of these x-values back into the equation?
3. Using your CAS’s “with operator” (“ **|** ”), verify that the calculator indeed

displays what you expected in question 2.

**Syntax**: Expr1=Expr2 **|** x=*value*

**Terminology**: The values of x for which both expressions produce equal results are commonly referred to as “solutions” to the equation.

**Part II (with CAS):**

**Expressions revisited, and their subsequent integration into equations**

Here are three expressions:

1. x(x2-9)
2. (x+3)(x2-3x)-3x-3
3. (x2-3x)(x+3)

II(A) Use your calculator to determine which of these expressions are equivalent. Fill in the table below with the appropriate information.

|  |  |  |
| --- | --- | --- |
| What I entered into the CAS | What the CAS displays | My interpretation of what the CAS displays |
|  |  |  |
|  |  |  |
|  |  |  |

II(B) Which expressions are equivalent? Which are not equivalent? Please explain.

II(C) Construct an equation using one pair of the given expressions that are not equivalent (see Question B, above). Use your calculator to determine those values of x, if any, for which both expressions in your equation are equal.

|  |  |
| --- | --- |
| What I entered into the CAS | What the CAS displays |
|  |  |
|  |  |

II(D) How would you use the CAS to verify that the values you found for x (in Question C, above) are solutions to your equation? Fill in the table below with the appropriate information.

|  |  |
| --- | --- |
| What I would enter into the CAS | The result that the CAS would display |
|  |  |

II(E) Construct an equation from another pair of the given expressions that are **not equivalent** (see Question B, above). Without using the CAS and without using paper and pencil algebra (use only a logical argument), determine the solution(s) to this equation. Please explain.

II(F) Construct an equation using a pair of the given expressions that **are equivalent** (see Part II B, above). Without using your CAS and without using paper and pencil algebra (use only a logical argument), determine the solution(s) of this equation. Please explain.

# Classroom discussion of Parts I and II

**Part III (paper & pencil): Constructing equations and identities**

**III(A)** 1. Construct an equation made from two equivalent expressions of your own choosing.

2. Explain your reasons for choosing these two particular expressions.

3. Without solving it, what can you say about the solutions of this equation?

4. How would you use the CAS to support your response to Question A3 just above?

**III(B)** 1. Construct an equation made from two non-equivalent expressions of your own choosing.

2. Explain your reasons for choosing these two particular expressions.

3. What can you say about the solutions of this equation?

4. How would you use the CAS to support your response to Question B3 just above?

# Classroom discussion of Part III, A & B

## Part IV (with CAS): Synthesis of various equation types

1. Solve the following equations using the SOLVE command of the CAS.

|  |  |
| --- | --- |
| Given equation | What the CAS displays |
| 1. (2–x)2 = x(2x–4) |  |
| 2. (x–5)(3x+7)–5 = 3x2-8x–40 |  |
| 3. 3x2–x–1 = 2x+5 |  |
| 4. |  |

2. How do you interpret each of the CAS displays in Question 1 above?

3. What does the nature of an equation’s solution(s) indicate about the equivalence or non-equivalence of the expressions that form the equation?

# Classroom discussion of Part IV