Meramec College Algebra TEST 1 Critique Spring 2006

Very Basic Algebra Errors

1) 75% of students claimed $\left(1+\sqrt{x+4}\right)^2 = 1+x+4$ which is absolutely FALSE.
$(a + b)^2 \neq a^2 + b^2$
$(a + b)^2 = a^2 + 2ab + b^2$ because $(a + b)^2$ means $(a + b)(a + b)$ and whether you use the correct procedure for multiplying polynomials or you use the foil method you find that

$$\mathbf{(a + b)^2 = (a + b)(a + b) = a^2 + 2ab + b^2}$$

When I see an error like $\left(1+\sqrt{x+4}\right)^2 = 1+x+4$, I believe the student is simply manipulating symbols according to some incorrectly remembered rules rather than thinking of the meaning of those symbols (exponents) and performing the operations required.

This error in any problem you will cost you all the points for that problem.

2) Similarly if you claim that $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$ you will lose all points for that problem.
$\sqrt{a+b} = \sqrt{a} + \sqrt{b}$ is **FALSE**

3) Similarly if you write anything to indicate two equations are equal, you will lose all credit for that problem. To write something like 3x + 4 = 5x + 7 = 3x = 5x + 3 = -2x = 3 = x = 3/(-2) is complete **NONSENSE** and I will make no attempt to figure out what you might have been thinking. You will lose all credit for that problem.

4) Given the equation $K = \frac{1}{r} - 3m$ if you claim to multiply both sides of the equation by r you do not obtain $Kr = 1 - 3m$. Given the equation $K + 3m = \frac{1}{r}$ if you claim to multiply both sides of the equation by r you do not obtain r(K + 3m) = r. and when r(K + 3m) is expanded you do not obtain rK + 3m.

To multiply both sides of an equation by any expression requires that the entire expression on each side be multiplied by the multiplier.

When an expression like r(K + 3m) is expanded the Distributive Law must be your guide and then r(K + 3m) = rK + 3rm.

5) Addition and multiplication of complex numbers was performed correctly by the majority of students. Subtraction and division of complex numbers was performed incorrectly by the majority of students. In view of the fact that subtraction is defined in terms of addition and division is defined in terms of multiplication, the first two sentences are quite inconsistent.

If you know how to add and you know how to construct the opposite of a complex number, there is no reason for performing subtraction incorrectly. Similarly, if you know how to multiply complex numbers and you know how to construct the multiplicative inverse of a complex number, there is no reason for performing division incorrectly.

The idea of changing a subtraction problem to an addition problem is precisely how subtraction is defined, it is not conceptually difficult, and procedurally it is quite straight forward. Why then do I see a variety of erroneous attempts to calculate the difference of two complex numbers?

The idea of changing a division problem to a multiplication problem is precisely how division is defined, it is not conceptually difficult, and procedurally it is quite straight forward. Why then do I see a variety of erroneous attempts to calculate the quotient of two complex numbers?

6) You must know the basic formulas such as:
Quadratic Formula   Equation of a circle   Areas of familiar geometric shapes
Volumes of familiar geometric solids   Surface areas of familiar geometric solids
Distance between points   Relation between distance, rate, and time
Relation between percentage, percent, and base

7) To solve equations which contain irrational coefficients that are radicals, treat those coefficients as any other number. Do not try to eliminate the radicals by squaring both sides of the equation.