identity

Proof of Standard Algebraic Identities

Identity 1: $(a + b)^2 = a^2 + 2ab + b^2$
Proof: Lets start with left hand side,
$(a + b)^2 = (a + b)(a + b)$
By ditributive law;
$(a + b)^2 = a(a + b) + b(a + b)$
By multiplying each term, we get,
$(a + b)^2 = a^2 + ab + ba + b^2$
$(a + b)^2 = a^2 + 2ab + b^2$
L.H.S. = R.H.S.

Identity 2: $(a - b)^2 = a^2 - 2ab + b^2$
Proof: Lets start with left hand side,
$(a - b)^2 = (a - b)(a - b)$
By ditributive law;
$(a - b)^2 = a(a - b) - b(a - b)$
By multiplying each term, we get,
$(a - b)^2 = a^2 - ab - ba + b^2$
$(a - b)^2 = a^2 - 2ab + b^2$
L.H.S. = R.H.S.

Identity 3: $(a + b)(a - b) = a^2 - b^2$
Proof: Starting with left hand side, by ditributive law;
$(a + b)(a - b) = a(a - b) + b(a - b)$
Multiplying each term, we get,
$(a + b)(a - b) = a^2 - ab + ab - b^2$
$(a + b)(a - b) = a^2 - b^2$
L.H.S. = R.H.S.

Hence, with this, all three identities are proved. Now let us solve some problems based on these identities.

Algebra Identities Examples

Example 1: Solve $(2x + 3)(2x – 3)$ using algebraic identities.

Solution: By the algebraic identity number 3, we can write the given expression as;

$(2x + 3)(2x – 3) = (2x)^2 – (3)^2 = 4x^2 – 9$

Example 2: Solve $(3x + 5)^2$ using algebraic identities.

Solution: We know, by algebraic identity number 1,we can write the given expression as;

$(3x + 5)^2 = (3x)^2 + 2*3x*5 + 5^2$

$(3x + 5)^2 = 9x^2 + 30x + 25$