Answer on Question #53993 – Math – Trigonometry

Sin 3a+ sin2a- sin a = 4sin a cos a/2 cos 3a/2

Solution

We need to prove

$$sin3a + sin2a - sina = 4sinacos\frac{a}{2}cos\frac{3a}{2}$$

(1)

It is known that

$sin2a = 2sinacosa$,

$sin3a = sin2acosa + cos2asina = 2sinacos^2a + sina(1 - 2sin^2a) =$

$= 3sina - 4sin^3a,$

$cos\frac{a}{2}cos\frac{3a}{2} = \frac{1}{2}(cosa + cos2a) = \frac{1}{2}cosa + \frac{1}{2} - sin^2a.$

Left side of (1): $sin3a + sin2a - sina = 3sina - 4sin^3a + 2sinacosa - sina =$

$= 2sina - 4sin^3a + 2sinacosa$;

Right side of (1): $4sinacos\frac{a}{2}cos\frac{3a}{2} = 2sinacosa + 2sina - 4sin^3a.$

So leftside=right side, which proves that (1) holds true for any a