International Journal of Mathematical Archive-6(5), 2015, 164-165
Available online through www.ijma.info ISSN 2229 – 5046

SPECIAL ADDITION IN POLYNOMIALS USING NUMERICAL METHODS

DILEEP S*

Al-Azhar Polytechnic College, Thodupuzha P. O.-685605, India.

(Received On: 18-04-15; Revised & Accepted On: 31-05-15)

ABSTRACT

It is the method of finding equation of a curve that approximates a given set of data on the basis of this mathematical equation, predictions can be made in many statistical investigation. Through this equation we can find the next output of any peroidic function.

$$Y_{q+2} = \frac{(n+1)}{1!}y_{q+1} - \frac{n(n+1)}{2!}y_q + \frac{n(n+1)(n-1)}{3!}y_{q-1} - \frac{n(n+1)(n-1)(n-2)}{4!}y_{q-2} + \ldots$$

Where n = degree of the polynomial.

1. INTRODUCTION

Let

X: $x_1, x_2, x_3, x_4, x_5, \ldots$

Y: $y_1, y_2, y_3, y_4, y_5, \ldots$

$y_1, y_2, y_3, \ldots y_n$ be the corresponding x_i values of degree two polynomial. So we can find y_n value by without finding the polynomial. In this case x_i should be equally spaced.

For a two degree polynomial

$Y_{q+3}=3y_{q+2}-3y_{q+1}+y_q$

Example:

$f(x) = x^2+4x+2$

X:-5, -4, -3, -2,-1, 0, 1, 2, 3, 4,…

Y: 7, 2, -1, -2, -1, 2, 7, 14, 23, 34...

$(y_1)(y_2)(y_3)(y_4)(y_5)(y_6)(y_7)\ldots$

Let $y_7 =3y_6-3y_5+y_4$

$7=3(2)-3(-1)+-2$

2. Proof: How can find

$Y_{q+3}=3y_{q+2} -3y_{q+1}+y_q$

Let

X: $X_1\ X_2\ X_3\ X_4\ X_5\ X_6 \ldots X_n$

Y: $y_1\ y_2\ y_3\ y_4\ y_5\ y_6 \ldots\ \ y$

$\Delta y_3=y_3-y_2$

$\Delta y_4=y_4-y_3$

So $y_5=\Delta^2 y_4+ \Delta y_4+y_4$

$=\Delta y_4- \Delta y_3+y_2$

$=3y_4-3y_3+y_2$

Proof of the above relation

$Y_{q+3}=3y_{q+2} -3y_{q+1}+y_q$

$$\begin{aligned}a(x+3)^2+b(x+3)+c &=3[a(x+2)^2 +b(x+2)+c] - 3[a(x+1)^2 +b(x+1)+c]+ [a(x)^2 +b(x)+c]\\ &=3ax^2+12ax+12a+3bx+6b+3c-3ax^2-6ax-3a-3bx-3b-3c+ ax^2+ bx+c\\ &= (ax^2+6ax+9a) + (bx+3b) +c\\ &= a(x+3)^2+b(x+3) +c\end{aligned}$$

*Corresponding Author: Dileep S**

Evaluation of other polynomial

1) Evaluation for 1 degree polynomials
   $y_3=2y_2-y_1$

2) Evaluation for 3 degree polynomials
   $y_5=4y_4-6y_3+4y_2-y_1$

3) Evaluation for 4 degree polynomials
   $Y_6=5y_5-10y_4+10y_3-5y_2+ y_1$

4) Evaluation for 5 degree polynomials
   $Y_7=6y_6-15y_5+20y_4-15y_3+ 6y_2-y_1$

So from above, we can create a general equation for n degree polynomial

$Y_{q+2} = \frac{(n+1)}{1!}y_{q+1} - \frac{n(n+1)}{2!}y_q+\frac{n(n+1)(n-1)}{3!}y_{q-1}- \frac{n(n+1)(n-1)(n-2)}{4!}y_{q-2} + \ldots$

Where n = degree of the polynomial

Introducing a new series

$$\frac{(n+1)}{1!} - \frac{n(n+1)}{2!}+\frac{n(n+1)(n-1)}{3!} - \frac{n(n+1)(n-1)(n-2)}{4!} + \ldots = 1 \qquad (1)$$

We adding and subtracting 1 in equation (1)

$1= \frac{(n+1)!}{(n+1)!}$

$1- \frac{(n+1)!}{(n+1)!} + \frac{(n+1)!}{1!n!} - \frac{(n+1)!}{2!(n-1)!} + \frac{(n+1)!}{3!(n-2)!} -\frac{(n+1)!}{4!(n-3)!} +\ldots$

$=1-[n + 1_{C_0}+n + 1_{C_1}(-1)+ n + 1_{C_2(-1)^2} + n + 1_{C_3(-1)^2}+\ldots]$

$= 1- (1 - 1)^{n+1} = 1$

i.e. $\sum_{q=1}^{n} \frac{(-1)^{q+1}(n+1)!}{q![n-(q-1)]!} = 1$

3. THE PROOF OF GENERAL EQUATION

$(x + (y+2))^n = (n+1)(x+(y+1))^n - \frac{n(n+1)}{2!} (x+y)^n + \frac{n(n+1)(n-1)}{3!} (x+(y-1)^n +\ldots$

By binomial theorem

$(x+ (y+2))^n = x^n - nx^{n-1} (y+2) + \frac{n(n-1)}{2!} nx^{n-2} (y+2)^2+ \ldots$

I.e.;

$(x+ (y+2))^n = \frac{(n+1)}{1!} [x^n + nx^{n-1} (y+1) + \frac{n(n-1)}{2!} nx^{n-2} (y+1)^2+ \ldots] - \frac{n(n+1)}{2!}[x^n + nx^{n-1} (y) + \frac{n(n-1)}{2!} nx^{n-2} (y)^2+ \ldots]$
$+ \frac{n(n+1)(n-1)}{3!} [x^n + nx^{n-1} (y-1) + \frac{n(n-1)}{2!} nx^{n-2} (y-1)^2+ \ldots] \ldots$

$= x^n [\frac{(n+1)}{1!} - \frac{n(n+1)}{2!}+\frac{n(n+1)(n-1)}{3!} - \frac{n(n+1)(n-1)(n-2)}{4!} + \ldots]$
$- x^{n-1} (y+2) [n[\frac{(n+1)}{1!} - \frac{n(n+1)}{2!}+\frac{n(n+1)(n-1)}{3!} - \frac{n(n+1)(n-1)(n-2)}{4!} + \ldots]]$
$- x^{n-2} (y+2) [\frac{n(n-1)}{2!} [\frac{(n+1)}{1!} - \frac{n(n+1)}{2!}+\frac{n(n+1)(n-1)}{3!} - \frac{n(n+1)(n-1)(n-2)}{4!} + \ldots]] +\ldots$

We know

$[\frac{(n+1)}{1!} - \frac{n(n+1)}{2!}+\frac{n(n+1)(n-1)}{3!} - \frac{n(n+1)(n-1)(n-2)}{4!} + \ldots] = 1$

$(x+ (y+2))^n = x^n - nx^{n-1} (y+2) + \frac{n(n-1)}{2!} nx^{n-2} (y+2)^2+ \ldots$

Source of support: Nil, Conflict of interest: None Declared