Curve fitting :- "Least square method" for curve fitting gives a unique set of values to the constants in the equation of the fitting curve beforehand the equation of curve is given.

Another words :- we know that more than one equation of curve satisfied the given tabular form $y=f(x)$ i.e entry of x and y is given and $y=f(x)$. By curve fitting with least square method we can find only unique set of constants for assumed eqn of curve [(I) Straight line
(II) 2nd degree Polynomial equation i.e equation of Parabola]

(I) For Straight line

Let $y = ax+b$ satisfy the given tabular form — (1)

$x =$	x_0,	x_1	x_2	x_3	x_4
$y=f(x)=$	y_0	y_1	y_2	y_3	y_4

The normal eqns are written as

→ total number of entry $= 5$ $(x_0, x_1 \ldots x_4)$

$$\left.\begin{aligned} \Sigma y &= a\Sigma x + 4b \quad \text{— (A)} \\ \Sigma xy &= a\Sigma x^2 + b\Sigma x \quad \text{— (B)} \end{aligned}\right\}$$

by solving eqn (A) & (B) we get the value of the constants i.e. a and b

After that put the value of constants a and b in the ~~gr~~ imagine eqn of curve that is Straight line $y=ax+b$.

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(ii) For second degree polynomial eqn (Parabolic eqn)

Let $y = a + bx + cx^2$ — (1) is the eqn of Parabola satisfy the given tabular form entry $y = f(x)$

i.e

x	x_0	x_1	x_2	x_3	x_4	x_5
y	y_0	y_1	y_2	y_3	y_4	y_5

normal eqns are

$$\left.\begin{aligned} \Sigma y &= \overset{\text{no. of entry}=6}{6a} + b\Sigma x + c\Sigma x^2 \\ \Sigma xy &= a\Sigma x + b\Sigma x^2 + c\Sigma x^3 \\ \Sigma x^2 y &= a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4 \end{aligned}\right\} \text{—(A)}$$

To solve (A) we can find the value of constants a, b & c then put the value of constants in (1), we get required eqn of Parabola.

Case III: fitting other types of eqns into the form of straight line

(A) If $\boxed{y = ax^b \text{ — (1)}}$

we should have eqn (1) in St line eqn form for this

taking log both side

$$\log y = \log_{10} a + b \log_{10} x \quad \text{— (1)}$$

Now let $\log y = Y$ and $\log_{10} x = X$ ~~but there is~~

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and $A = \log_{10} a$

Thus eqn (1) becomes

$$Y = A + bX \quad -(11)$$ → Now solve eqn

(11) as previous straight line method and [find A and b]

at last

convert A into a

i.e if $A = \log_{10} a$

$$\Rightarrow a = 10^{A}$$

Thus put the value of a and b into eqn

$$\underline{y = ax^{b}}$$

(B) If $\boxed{y = ae^{bx}}$ $\Rightarrow$ $\log y = \log_{10} a + bx \log_{10} e$

$$\Rightarrow Y = A + xB$$

where

$\boxed{A = \log_{10} a \quad a = 10^{A}}$ → put in last

$\boxed{b \log_{10} e = B \quad b = B \times \log_{e} 10}$ → put in last

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(c) $\boxed{xy^a = b}$

$\log_{10} x + a\log_{10} y = \log_{10} b$

$\cancel{X + aY = \log_{10} b}$

$\Rightarrow \log_{10} y = \frac{1}{a}\log_{10} b - \frac{1}{a}\log_{10} x$

$Y = A + BX$ —(1)

where $Y = \log_{10} y$, $X = \log_{10} x$

$B = -\frac{1}{a}$, $A = \frac{1}{a}\log_{10} b$ → (2)

$\Rightarrow aA = \log_{10} b \Rightarrow b = 10^{aA}$

Solve eqn (1) and find A and B the consequently find a and b then put in $xy^a = b$

(d) $y = ax + bx^2$ —(1)

$\frac{y}{x} = a + bx$

$\Rightarrow Y = a + bx$ } → find a and b then put in (1)

(f) $y = ax + b/x$ —(1)

$xy = ax^2 + b$

$Y = aX + b$ } find a and b put in (1)

(e) $y = ax^2 + b/x$ —(1)

$xy = ax^3 + b$

$Y = aX + b$ } find a and b then put in (1)

(g) $y = a + bx^2$ —(1)

$y = a + bX$ } find a and b

Put in (1)