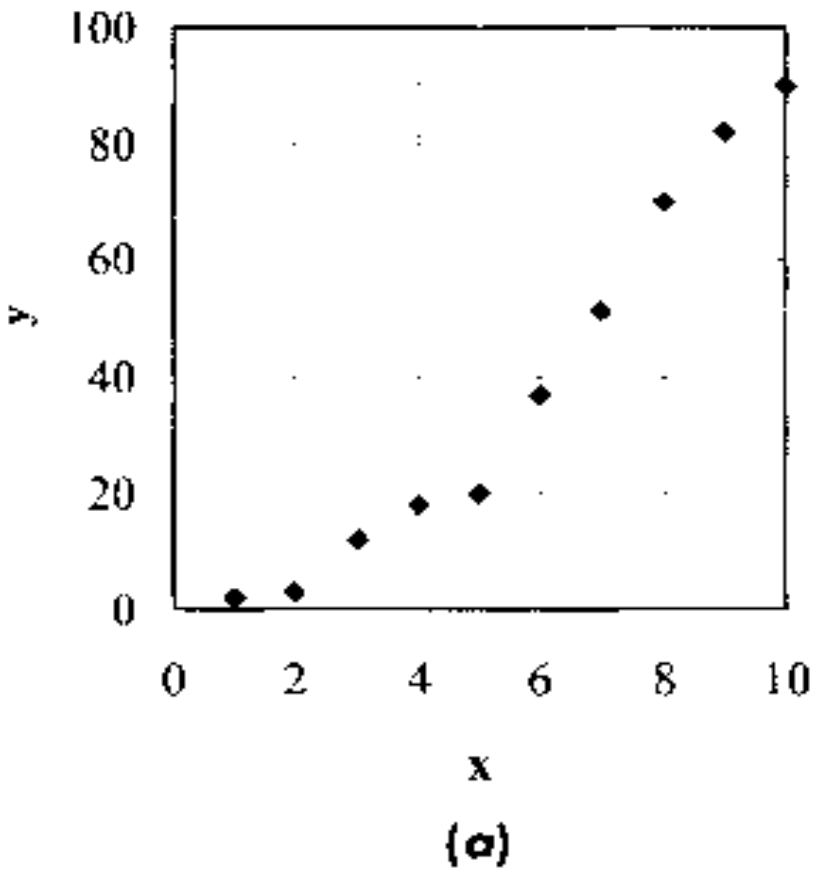
Choice of Graph

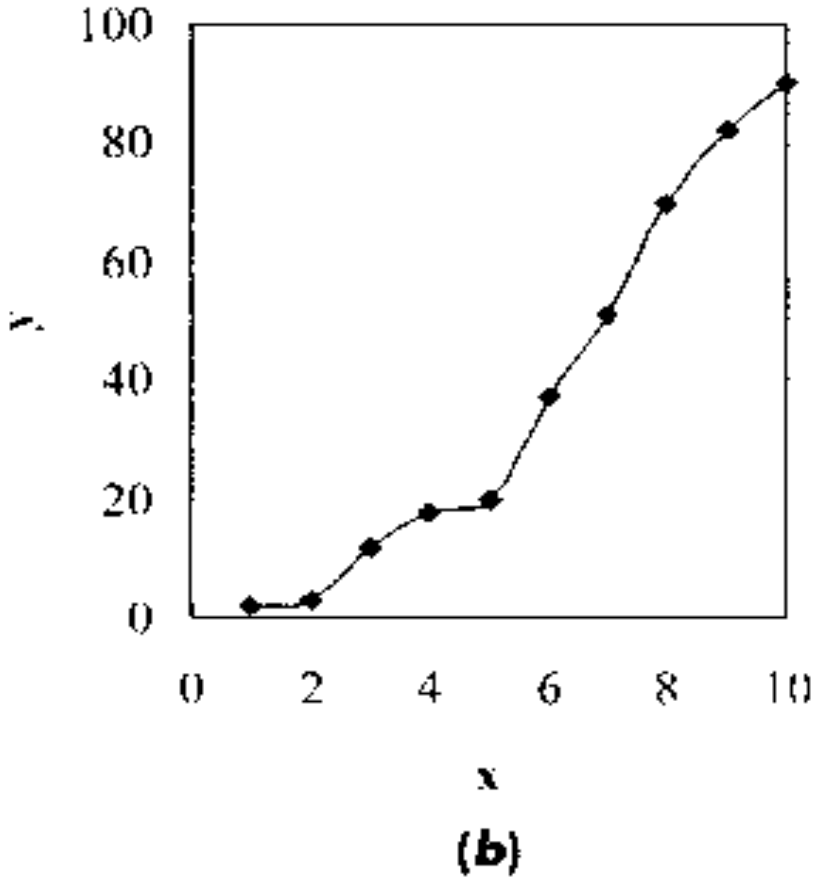
- An engineer has many graph formats available for presenting experimental data or calculation results. While bar charts, column charts, pie charts, and similar types of displays have some applications, by far the most frequently used display is the X-Y graph with choices of coordinates to match the situation. This basic graph has several variations in format that we shall illustrate by plotting the simple table of X-Y data shown below.

X	Y
1	2
2	3.1
3	12
4	18
5	20
6	37
7	51
8	70
9	82
10	90

- Six formats for plotting the data are shown in Fig. (a through f). The choice of format depends on both the source and type of data as well as the eventual use to be made of the display.
- The following paragraphs discuss the six alternatives. The computer graphics were generated in Microsoft Excel.



(a)



(b)

a. For graph (a) :

This display presents just the raw data points with a data marker for each point.

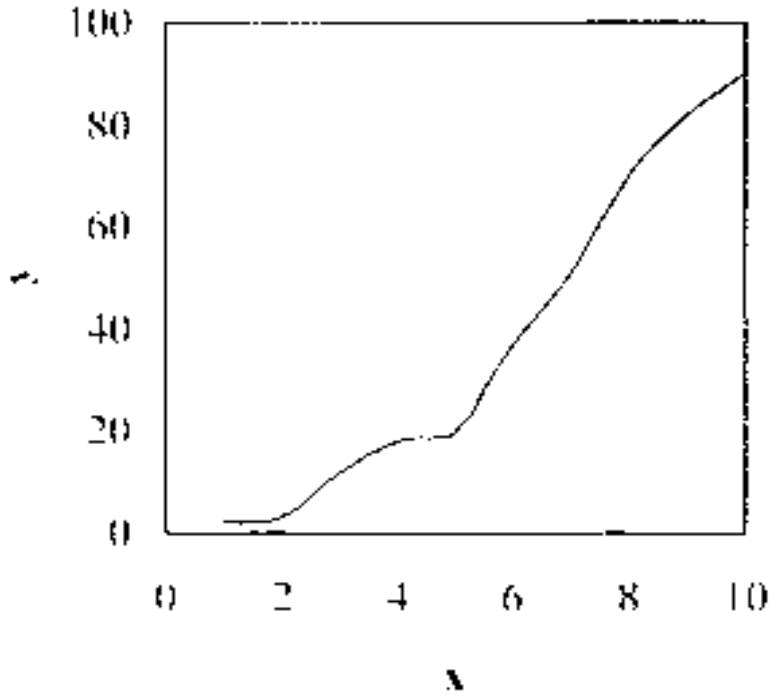
It might be selected as an initial type of display before deciding on a more suitable alternative.

It may be employed for either raw experimental data points or for points calculated from an analytical relationship.

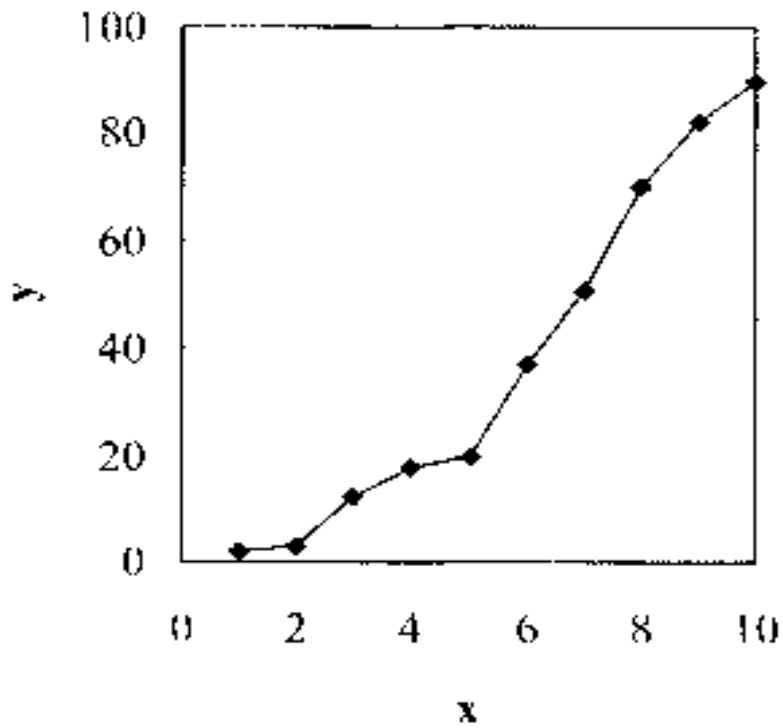
b. For graph (b) :

This display presents the points with the same data markers connected by a smooth curve drawn either by hand or by a computer graphics system; in this case, by computer.

This display should be used with caution. If employed for presentation of experimental data, it implies that the smooth curve describes the physical phenomena represented by the data points.



(c)



(d)

- For graph (c) :

It would almost never be employed for presentation of experimental data because the actual data points are not displayed.

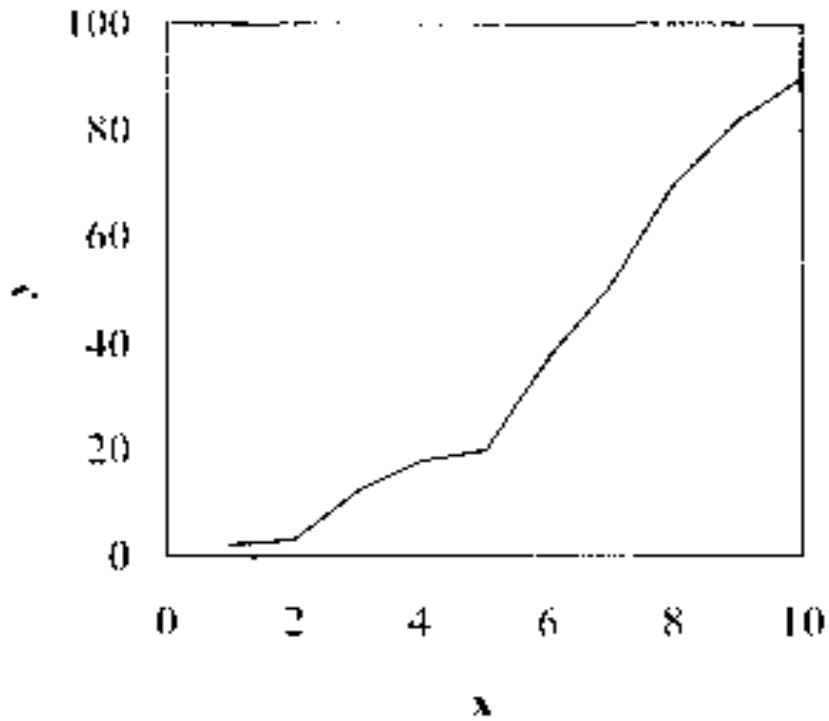
In contrast, this type of display is obviously quite suitable for presenting the results of calculations.

- For graph (d) :

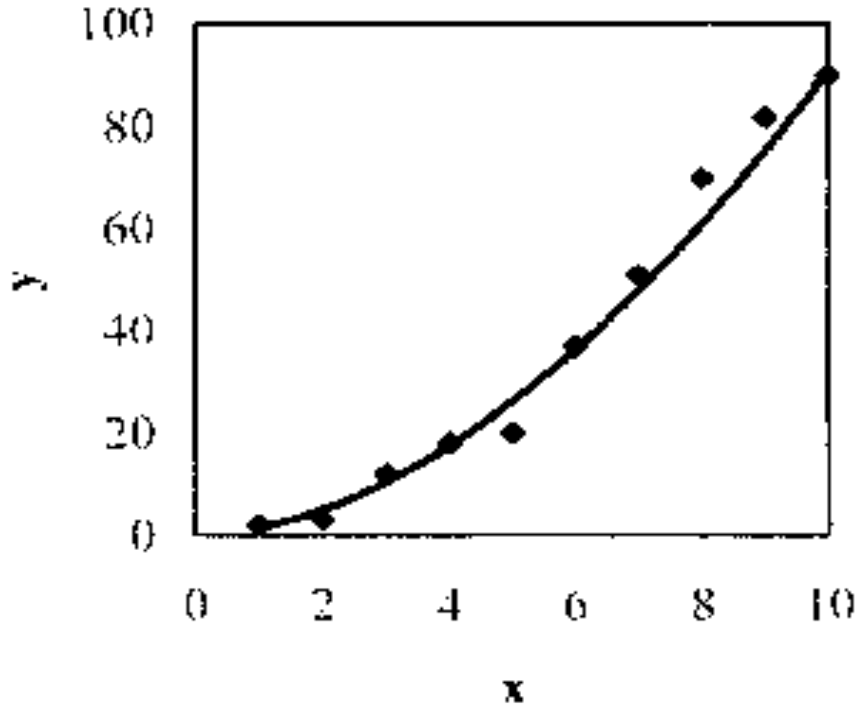
This display presents the data points connected with straight-line segments in-stead of a smooth curve, and avoids the implication that the physical situation behaves in a certain "smooth" fashion.

The plot is typically employed for calibration curves where linear interpolation will be used between points, or when a numerical integration is to be performed based on the connecting straight-line segments.

If used for presentation of experimental data, the implication is the same as in (b) and (e) that the physical system actually behaves as indicated, in this case with a somewhat jerky pattern.



(e)



(f)

- For graph (e) :

It might be used for calculation results where the engineer wants to avoid computer smoothing between the calculated points.

- For graph (f) :

Finally, the format presented in (f) is one that is frequently selected to present experimental results where uncertainties in the measurements are expected to result in scatter of the data points.

A trend line equation may or may not be displayed along with the curve.

When experimental uncertainties are expected to contribute significantly to the scatter of data, as they do in many cases, a full discussion of their nature should be offered in the accompanying narrative material.