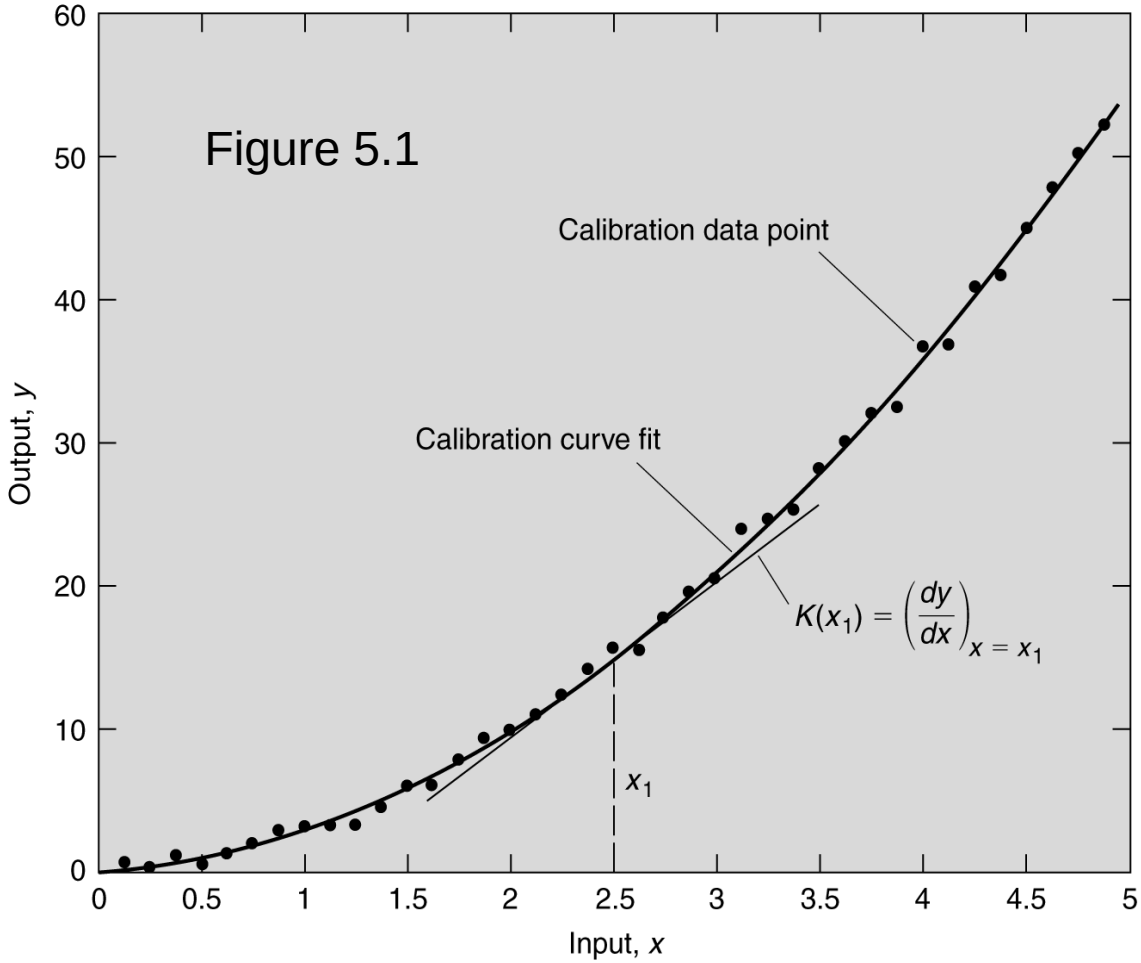
Calibration and Static Response

• Measurement systems and their individual components ‘respond’ to inputs by producing an output for a given input.

• The output can differ from the input by having a different frequency and amplitude, and also a phase lag (time delay).

• For linear systems, the frequency is not altered. However, the output *can* have an amplitude that is different than the input, and the output *can* lag the input.

A Static Calibration



Calibration Terms

• Calibration is the comparison of a measured value to a known, much more accurate value, known as the true value.

• When a calibration consists of a number of comparisons, the *maximum* relative error often is used to characterize the calibration.

In-Class Example

Statement: A hot-wire anemometer system was calibrated in a wind tunnel using a pitot-static tube. The data obtained is presented in Table 5.1. Using this data, a linear calibration curve-fit was made, which yielded

$$E^2 = 10.207 + 3.284\sqrt{U}.$$

Determine the following for the curve-fit: [a] the sensitivity, [b] the maximum absolute error, [c] the maximum relative error, and [d] the accuracy at the point of maximum relative error.

Velocity, U (m/s)	Measured voltage, E_m (V)	Calculated voltage, E_c (V)
0.00	3.19	3.19
3.05	3.99	3.99
6.10	4.30	4.28
9.14	4.48	4.49
12.20	4.65	4.66

Velocity, U (m/s)	Measured voltage, E_m (V)	Calculated voltage, E_c (V)
0.00	3.19	3.19
3.05	3.99	3.99
6.10	4.30	4.28
9.14	4.48	4.49
12.20	4.65	4.66