Objective Analysis of Student Data

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Introduction

"How good is my data?" How much data do I need to take?" These are common student questions and are often difficult to answer. In the present paper we outline methods for objectively deciding such matters.

Linear Relationships

In our typical first year physics course and advanced laboratory course many of the relationships we have students investigate are linear:

$F = ma$	plot	$F \ vs \ a$
$F = kx$	plot	$F \ vs \ x$
$PV = NkT$	plot	$P \ vs \ \frac{1}{V}$
$Q = mL$	plot	$Q \ vs \ m$
$f = \mu N$	plot	$f \ vs \ N$
$V = IR$	plot	$V \ vs \ I$
$R = \frac{\rho L}{A}$	plot	$R \ vs \ L$
$I^2 R\Delta t = mc\Delta T$	plot	$\Delta T \ vs \ \Delta t$
$n\lambda = \frac{dy}{L}$	plot	$y \ vs \ n$
$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$	plot	$\frac{1}{d_o} \ vs \ \frac{1}{d_i}$
$B = \frac{\mu_o N}{a} I\left(\frac{4}{5}\right)^{\frac{3}{2}}$	plot	$B \ vs \ I$
$qV = \frac{hc}{\lambda}$	plot	$V \ vs \ \frac{1}{\lambda}$