Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

A. (8) Calibration with 2-point functions.

1. A Baratron pressure gauge gives a reading of –0.27 V when $P = 0$, and 7.08 V when $P = 760$ torr. What is the apparent P when this gauge reads 4.44 V?

2. A particular thermistor shows a resistance of 13.27 k at 10.0°C and 1.557 k at 50.0 °C. The resistance is measured to be 8.93 k when the thermistor is immersed in an unknown bath. What is the apparent temperature of the bath?
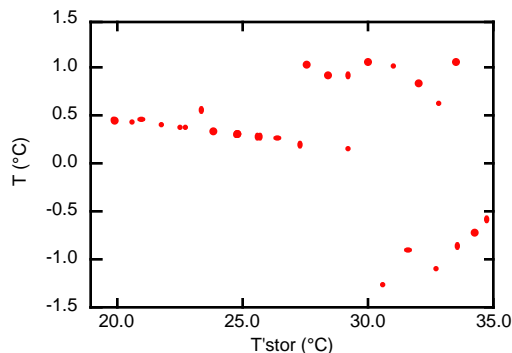

B. (4) Calibration — Fitting the data. You obtain the illustrated results upon fitting your thermistor calibration data, obtained over the region 19-32°C.

1. Properly state the correction and its statistical error at 25°C.

$y = a + b*(x-25) + c*(x-25)^2$		
	Value	Error
a	0.050861789	0.001247068
b	0.0036498518	0.0002037433
c	-0.00074572609	3.839555e-05
Chisq	0.00049905721	NA
R	0.96765516	NA

2. If there are 19 data points, what is the estimated standard deviation (s_y) of these data?
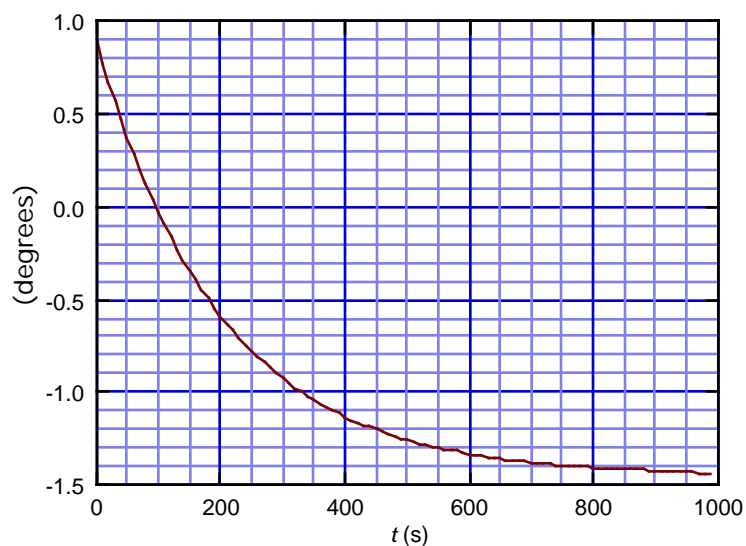

C. (2) Calibration — Paying attention!

Suppose you obtained the illustrated thermistor calibration data at the BombCal station while warming up the bath, starting just below 20°C. What do you think happened at ~27°C?

D. Inversion of pickanose.

1. (10) The figure to the right represents optical rotation data for a hypothetical sugar *pickanose*. From this figure, give approximate values for the following quantities: (a) α_0, (b) α_∞, (c) the inversion time (in s), (d) the half-life, and (e) the effective rate constant k_{eff}.

2. (3) The inversion of pickanose is an acid-calalyzed reaction, with a rate constant of 0.0824 L mol^{-1} min^{-1}. A reaction is initiated by mixing 20.00 mL of 4.0 M HCl with 10.0 mL of an aqueous solution of pickanose. Assuming that volumes are additive, calculate the effective rate constant for this mixture.