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AST2 320 -500
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ASSIGNMENT 3

4.13

(a) done in code

(b) $\mu = 26$, $\sigma = 5$

Standard Gaussian Distribution

$$P_G(z) = \frac{1}{\sigma\sqrt{2\pi}} \cdot e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \quad ; \quad x_1 = 15 \, , \, \Delta x = 2$$

x_i	$P_G(x_i) * 400$ (to normalize to area of histograms)
15	2.838
17	6.316
19	11.978
21	19.358
23	26.658
25	30.233
27	30.283
29	26.658
31	19.358
33	11.978
35	6.316
37	2.838

(c)

calculating χ^2:

by def. $\chi^2 = \sum_{i=1}^{N} \left(\frac{x_i - \mu_i}{\sigma_i} \right)^2$ where $\mu_i = 26$, $\sigma_i = 5$

* x_i = mid point data points w/ each frequency accounted for.
∴ array of 200 pts

x_i	frequency	$x_i^2 \times$ frequency
15	4	19.36
17	8	25.92
19	11	21.56
21	20	20.0
23	26	9.36
25	31	6.24
27	29	1.16
29	22	3.52
31	26	28.0
33	13	23.68
35	5	16.2
37	2	9.68
39	3	20.28

$\sum \chi_i^2 = \boxed{204.16 = \chi^2}$

(d) expectation value

by def: $\langle \chi^2 \rangle = \nu = n - n_c$ where n = # of points = 200, n_c = points available = 0

$\therefore \boxed{\langle \chi^2 \rangle = 200}$

comparing the hand calculated values w/ the python values gives almost the exact values when neglecting precision error due to truncation error.

in analyzing the % error of χ^2 = $\frac{|204.16 - 200|}{200} \times 100 = 2.08\%$. not bad!