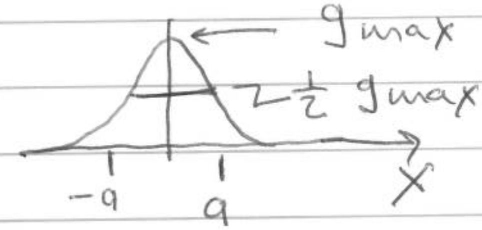
TEC 4 $\quad g(x) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

w/ $\int_{-\infty}^{\infty} g(x)\,dx = 1$

WLOG, SET $\mu = 0$.



FIND $2a = \text{FWHM}$

$$g_{MAX} = g(0) = \frac{1}{\sqrt{2\pi}\,\sigma}$$

$$\frac{1}{2} g_{MAX} = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-a^2/2\sigma^2} = \frac{1}{2} \frac{1}{\sqrt{2\pi}\,\sigma}$$

$$\Rightarrow e^{-a^2/2\sigma^2} = 1/2$$

$$a = (2 \ln 2)^{1/2} \sigma$$

$$\text{FWHM} = 2a = 2\,(2 \ln 2)^{1/2} \sigma$$

$$\boxed{\text{FWHM} = 2.359\,\sigma}$$

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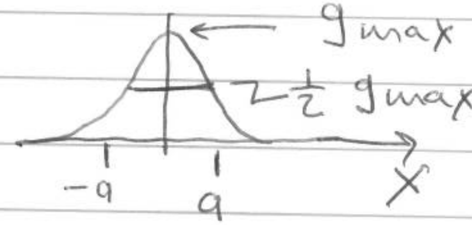

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TEC5. IS THE DIFFERENCE BETWEEN

E_i & E_F "SIGNIFICANT"?

BY SIGNIFICANT THE PROBLEM MEANS IS THE PROBABILITY OF THE DIFFERENCE, GIVEN THE SIZE OF THE ERRORS, MORE THAN 5%?

$$\Delta = |E_F - E_i|$$

$$\sigma_\Delta = \sqrt{\sigma^2(E_F) + \sigma^2(E_i)}$$

ACCORDING TO THE RULE FOR ADDING ERRORS IF YOU SUBTRACT TWO NUMBERS

$$\Delta = 15 \text{ MeV}$$

$$\sigma_\Delta = \sqrt{8^2 + 4^2} \text{ MeV} = 8.9 \text{ MeV}$$

FOR CONSERVATION OF ENERGY, WE EXPECT Δ TO BE DISTRIBUTED NORMALLY ABOUT 0. OUR RESULT IS $15/8.9\ \sigma$ AWAY FROM 0. PROB (OUTSIDE 1.7) = 9%, (SEE APPENDIX A). THE DIFFERENCE IS <u>NOT</u> SIGNIFICANT.

SIGNIFANT DIFFERENCE HAS LOW PROB OF HAPPENING. LOW PROB MEANS $\leq 5\%$.

TAYLOR 7.4   PLUG & CHUG   EQS (7.10) & (7.11)

$$\bar{\lambda} = \frac{\Sigma w_i \lambda_i}{\Sigma w_i} = \frac{\frac{503}{10^2} + \frac{491}{8^2} + \frac{525}{20^2} + \frac{570}{40^2}}{\frac{1}{10^2} + \frac{1}{8^2} + \frac{1}{20^2} + \frac{1}{40^2}}$$

$$= 500 \text{ nm}$$

$$\sigma_{\bar{\lambda}} = \frac{1}{\sqrt{\Sigma x_i}} = 6 \text{ nm}$$

$$\boxed{\bar{\lambda} = 500 \pm 6 \text{ nm}}$$