TEC 2

(a)

$$\sigma^2 = \int_{\mu-a}^{\mu+a} (x-\mu)^2 * \frac{1}{\sqrt{2\pi}\,\sigma_s} e^{-\frac{(x-\mu)^2}{2\sigma_s^2}} dx$$

HERE, $\mu = 100\ \Omega$

$\sigma_s = 20\ \Omega$

$\sigma = 5\ \Omega$

PERHAPS EASIEST TO EVALUATE INTEGRAL NUMERICALLY BY ADJUSTING LIMITS OF INTEGRATION SO THAT LHS & RHS MATCH.

FIND A JAVA NUMERICAL INTEGRATER ON THE WEB. (I USED ONE AT WILEY.COM.)

I FOUND $a = 12.7\ \Omega$ (YIELDS $\sigma^2 = 24.7\ \Omega^2$ WHICH IS CLOSE ENOUGH ~~...~~ TO $\sigma^2 = 25\ \Omega^2$.

(b) PROB: SEE TAYLOR EQ. 5.35

$$\text{PROB} = \frac{1}{\sqrt{2\pi}} \int_{-t}^{t} e^{-z^2/2}\, dz$$

$$\text{w/ } t = \frac{12.7\ \Omega}{20\ \Omega} = 0.64$$

TEC 2.

(b) LOOK UP IN APPENDIX A OF TAYLOR

$$PROB(100 - a \le R \le 100 + a) = 0.48$$

$$\boxed{PROB = 48\,\%}$$

(c) A BIT TRICKY. NEED TO COMPUTE σ^2 OF A PROBABILITY DISTRIBUTION THAT LOOKS LIKE A GAUSSIAN w/ A BITE TAKEN OUT OF IT:

MISSING SINCE YOU REMOVED ALL RESISTORS w/ $\mu - a \le R \le \mu + a$

μ OF NEW DISTRIBUTION $= 100\,\Omega$

NOTE THAT NEW DISTRIBUTION IS SYMMETRIC ~~w/r~~ ABOUT $\mu = 100\,\Omega$.

TEC 2

(c) ~~NE~~ NORMALIZE PROPERLY NEW DISTRIBUTION

$$\int G'(Z) = \frac{C_0}{\sqrt{2\pi}} \int_{-\infty}^{-t} e^{-Z^2/2}\, dZ$$

$$+ \frac{C_0}{\sqrt{2\pi}} \int_{+t}^{\infty} e^{-Z^2/2}\, dZ$$

$$= 1$$

$$\Rightarrow C_0 = \frac{1/2}{\underbrace{\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{-t} e^{-Z^2} dZ}_{I_0}}$$

$$w/\ t = \frac{a}{\sigma} = \frac{12.2}{20} = 0.64$$

$$I = 0.5 - 0.239 \quad \text{(SEE APPENDIX B)}$$
$$= 0.261$$

$$\boxed{C_0 = \frac{0.5}{0.261} = 1.916}$$

TEC 3

(c) NOW THAT NEW DISTRIBUTION IS PROPERLY NORMALIZED WE CAN COMPUTE σ^2.

$$\sigma^2_{NEW} = \frac{C_0}{\sqrt{2\pi}} \int_{-\infty}^{-t} \sigma^2 z^2 e^{-z^2/2}\, dz \qquad (\sigma = 20\,\Omega)$$

$$+ \frac{C_0}{\sqrt{2\pi}} \int_{+t}^{\infty} \sigma^2 z^2 e^{-z^2/2}\, dz$$

$$= C_0 \left[\int_{-\infty}^{\infty} \frac{\sigma^2}{\sqrt{2\pi}} z^2 e^{-z^2/2} dz - \int_{-t}^{+t} \frac{\sigma^2}{\sqrt{2\pi}} z^2 e^{-z^2/2} dz \right]$$

$$= C_0 \left[20^2\,\Omega^2 - 5^2\,\Omega^2 \right]$$

$$\sigma_{NEW} = \sqrt{1.916} \left[375\,\Omega^2 \right]^{1/2}$$

$$\boxed{\sigma_{NEW} = 26.9\,\Omega}$$

TEC 3.

(a) ESTIMATION OK.
I MENTALLY ESTIMATED AVERAGE AND THEN ESTIMATED AVERAGE DEVIATION FROM THAT AVERAGE.
I GOT $\sigma \simeq 0.02$ msec.
OTHER ANSWERS OK.

(b) USE A CALCULATOR & REMEMBER HOW TO CALCULATE σ OF SAMPLE, NOT PARENT DISTRIBUTION.

$\mu = 5.770$ msec
$\sigma = 0.024$ msec

$\sigma_\mu = \sigma / \sqrt{N} = 0.008$ msec

(c) PROB $(t \geq \mu + 2\sigma$ OR $t \leq \mu - 2\sigma) = 5\%$

FOR A SINGLE MEASUREMENT.

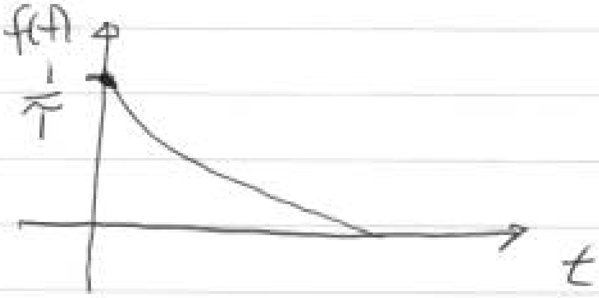
HENCE FOR 10 M'MENTS

~~PROB~~ # M'MENTS $= 10 \times 0.05 = 0.5$ M'MENT

TAYLOR 5.6

$$f(t) = \frac{1}{\tau} e^{-t/\tau}$$

(a)



(b) $\int_0^\infty \frac{1}{\tau} e^{-t/\tau} dt = -e^{-t/\tau}\Big|_0^\infty = 0 - (-1) = +1$

(c) $\bar{t} = \int_0^\infty t\, f(t) dt = \int_0^\infty \frac{t}{\tau} e^{-t/\tau} dt$

INT BY PARTS

$$\int_0^\infty \frac{t}{\tau} e^{-t/\tau} dt = t\left(-e^{-t/\tau}\right)\Big|_0^\infty - \int_0^\infty -e^{-t/\tau} dt$$

$$\bar{t} = +\int_0^\infty e^{-t/\tau} dt$$

$$= -\tau e^{-t/\tau}\Big|_0^\infty$$

$$= -\tau(0-1)$$

$$\boxed{\bar{t} = \tau}$$