Chapter 5a

$E[X] = .4(1) + .2(2) + .4(3) = \boxed{2 = E[X]}$

$E[X^2] = .4(1^2) + .2(2^2) + .4(3^2) = 4.8$

$Var[X] = 4.8 - 2^2 = \boxed{.8 = Var[X]}$

Chapter 5b

1.) $E(X) = \int_0^1 X \cdot 2x\,dx = \frac{2x^3}{3}\Big]_0^1 = \boxed{\frac{2}{3} = E[X]}$

$E(X^2) = \int_0^1 X^2 \cdot 2x\,dx = \frac{x^4}{2}\Big]_0^1 = \frac{1}{2}$

$Var[X] = \frac{1}{2} - \left(\frac{2}{3}\right)^2 = \frac{1}{2} - \frac{4}{9} = \boxed{\frac{1}{18} = Var[X]}$

2.) $\begin{cases} 0 \text{ for } \tau < -T \\ 1 \text{ for } -T < \tau < 0 \\ 1 \text{ for } \tau = 0 \\ 0 \text{ for } 0 < \tau < T \\ 0 \text{ for } \tau \geq T \end{cases} = \begin{cases} 1 \text{ for } -T < \tau \leq 0 \\ 0 \text{ otherwise} \end{cases}$

if $-.1 < .02 \leq 0$ $\boxed{R_X(-.02) = 1}$

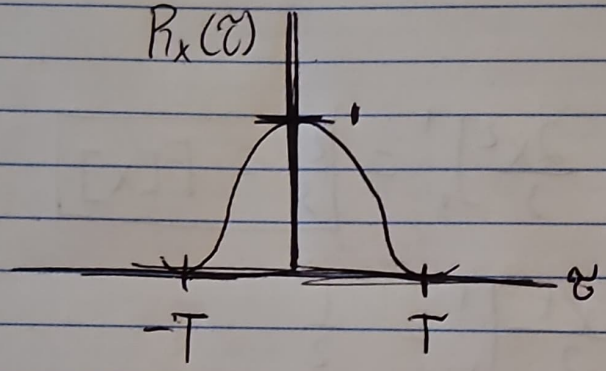
Chapter 5c

1.)

~~$S_x(f) = 1 \cdot f_0 \operatorname{sinc}^2(f \cdot f_0) \quad S_x(0) = f_0 \operatorname{sinc}^2(f_0)$~~

$$S_x(f) = \text{Tri}\left(1 - \frac{|f|}{f_0}\right) + \delta(f)$$

$$R_x(\tau) = \text{Tri}\left(1 - \frac{|\tau|}{T}\right) + \delta(\tau)$$



2.) $H(f) = A \cdot \text{rect}\left(\frac{f}{f_0}\right)$

$$S_x(f) = \text{Tri}\left(1 - \frac{|f|}{f_0}\right) + \delta(f)$$

$$S_x(f) = \left|A \cdot \text{rect}\left(\frac{f}{f_0}\right)\right|^2 \cdot \left(\text{Tri}\left(1 - \frac{|f|}{f_0}\right) + \delta(f)\right)$$