MECH 6312 - Exam 4 | Jonas Wagner | 2020-11-02

1) $n = 10$

a) Rayliegh $\sigma^2 = 64$

90% CI

$$f(x) = \frac{x}{\sigma^2} e^{\frac{-x^2}{2\sigma^2}} u(x)$$

$$\boxed{\mu = \sqrt{\frac{\pi}{2}}\,\sigma \approx 15.52}$$

$$\sigma = \sqrt{\frac{Var(\omega)}{2 - \frac{\pi}{2}}} = 12.2$$

? acording to dist...

$$\hat{\mu}_x(n) = \frac{1}{n} \sum_{i=1}^{n} x_i = 46.8$$

$$P\left[-a \leq \sqrt{\frac{\pi}{2}}\,\sigma \leq a\right]$$

$$[-12.3, 17.7]$$

b) $\hat{\mu}_x(n) = \frac{1}{n} \sum_{i=1}^{n} x_i = \boxed{46.8}$

$$\sigma_x^2(n) = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \hat{\mu}_x(n))^2 = \boxed{71.73}$$

$\frac{1+\delta}{2} = 0.95$ dof $= 9$

$$t_{[0.95; 9]} = 1.833$$

$$CI: \hat{\mu}_x \pm t_{[0.95; 9]} \frac{\sigma_x}{\sqrt{n}}$$

$$46.8 \pm 1.833 \left(\frac{71.73}{\sqrt{10}}\right)$$

$$\boxed{46.8 \pm 4.9}$$

$$\boxed{[41.89, 51.71]}$$

2)

$$\hat{X}_{[0.5]} = \frac{Y_5 + Y_6}{2} = \frac{43+47}{2}$$

a) $\boxed{\hat{X}_{[0.5]} = 45}$

b) 65% CI $\quad \gamma = 0.65$

$$\beta_n = Z_{[(1+\gamma)/2]} = Z_{[0.825]} = 0.935$$

$$r = (n - \sqrt{n}\, Z_{(1+\gamma)/2} + 1)/2 = \frac{10 - \sqrt{10}(0.935) + 1}{2}$$

$r = 4.0216 \qquad CI = [Y_r, Y_{n-r+1})$

CI: $[Y_4, Y_7)$

$\boxed{X_{[0.5]} = [42, 51) \text{ w/ 65\% confidence}}$

$$Y_{4.02} = Y_4 + \quad Y$$