Øving 5 - sannsynlighet

oppg 1

i) Graf 1 - kan ikke vær negativ
Graf 2 - integralet/arealet er større enn 1.
Graf 3 - kan være mulig
Graf 4 - $\int_{-\infty}^{\infty} f(x)dx \neq 1$

ii) Graf ~~5~~ - kan ikke synke
Graf - mulig
Graf - mulig
Graf - ikke kontinuelig

iii) Graf 8 og 6 hører sammen

oppg 2) Stokastisk variabel X med sannsynlighetstetthet

$$f(x) = \begin{cases} 1 & \text{for } -0,5 < x < 0,5 \\ 0 & \text{ellers} \end{cases}$$

a) Beregn forventning og variansen til X

$$E(X): \int_{-\infty}^{\infty} x f(x)dx = \int_{-\infty}^{0} x f(x)dx + \int_{-0,5}^{0,5} x f(x)dx + \int_{1}^{\infty} x f(x)dx = \int_{-0,5}^{0,5} x f(x)dx$$

$$\int_{-0,5}^{0,5} x\,dx = \left[\frac{1}{2} x^2\right]_{-0,5}^{0,5} = 0,25 - 0,25 = \underline{\underline{0}}$$

$$Var(x) = \int_{-\infty}^{\infty} (x-4)^2 f(x)dx = \cancel{\int_{-\infty}^{-0,5} (x-4)^2 f(x)dx +}$$

$$\int_{-\infty}^{-0,5}(x-4)^2 f(x)\,dx + \int_{-0,5}^{0,5}(x-4)^2 f(x)\,dx + \int_{0,5}^{\infty}(x-4)^2 f(x)\,dx$$

$$= 0 + \int_{-0,5}^{0,5}(x-4)^2 f(x)\,dx + 0 = \int_{-0,5}^{0,5} x^2 f(x)\,dx$$

$$= \int_{-0,5}^{0,5} x^2\,dx = \left[\frac{1}{3}x^3\right]_{-0,5}^{0,5} = \frac{1}{24} - \left(-\frac{1}{24}\right) = \underline{\underline{\frac{1}{12}}}$$

b) $P(X < 0,25)$

$$\int_{-0,5}^{0,25} f(x)\,dx = \left[x\right]_{-0,5}^{0,25} =$$

$$= 0,25 - (-0,5) = \underline{\underline{0,75}}$$

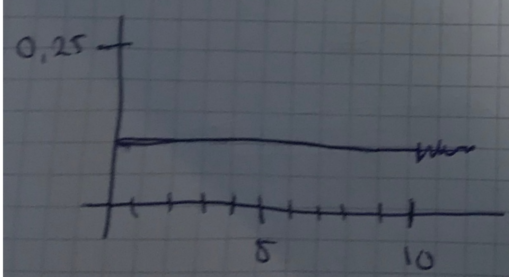
3) 10 min intervaller

T = ventetid

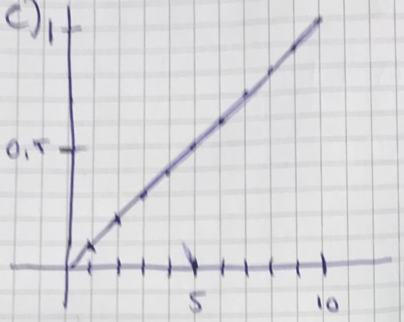
$y = 10$

a) kan anta at T er ~~$\frac{1}{10}$~~
mellom 0 og 10
[0, 10>

b) $\lambda = \frac{1}{y} = \frac{1}{10}$



c)



d) $\cancel{P(T>7) = 1 - P(T<7) = 1 - G(7)}$

$\cancel{= 1 - \lambda e^{-\lambda \cdot 7} = 1 - \frac{1}{10} e^{-\frac{7}{10}} = 1 - 0{,}05 = 0{,}95}$

d) $P(x>7) = P(10) + P(9) + P(8) = \underline{\underline{0{,}3}}$

e) $E(x) = \frac{10+0}{2} = \underline{5}$

$\text{Var}(x) = \frac{(0-10)^2}{12} = \frac{25}{3} = \underline{8{,}3}$

4) Forvents å lyse i 2500 t.

a) $T =$ ~~2500~~ ventetid

$Y = 2500$

$\lambda = \frac{1}{2500} =$

$$f(x) = \begin{cases} \cancel{\lambda e} \frac{1}{2500} e^{\frac{-x}{2500}}, & \text{for } x > 0 \\ 0 & \text{ellers} \end{cases}$$

b) $P(X \leq 200) = 1 - e^{-\frac{200}{2500}}$

$= \underline{\underline{0{,}077}}$

c) $P(X = 1000) +$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{P(P(X \geq 2000) \cap P(X \geq 1000))}{P(X \geq 1000)}$$

$$= \frac{P(X \geq 2000)}{P(X \geq 1000)}$$

$$= \frac{1 - G(2000)}{1 - G(1000)} = \frac{1 - (1 - e^{-\frac{2000}{2500}})}{1 - (1 - e^{-\frac{1000}{2500}})}$$

$$= \frac{0{,}449}{0{,}67} = \underline{0{,}67}$$

$\cancel{0}$