3/26/18 p1

OLD EXAM 1 d

P(0 DECAYS)

$$P(k) = \frac{e^{-\lambda} \lambda^{k}}{k!}$$

$\lambda = \alpha = 4$

$$P(0) = \frac{e^{-4} 4^{0}}{0!} = e^{-4}$$

2

time between decays is exponential (if decays are indep)

4 decays per msec -> 1/4msec between decays

$\lambda = \frac{1}{4}$

$$f(x) = \lambda e^{-\lambda x}$$

check $\int f = 1 = \int_0^\infty \lambda e^{-\lambda x} dx$

$$= \lambda \int_0^\infty e^{-\lambda x} = \left. \frac{\lambda e^{-\lambda x}}{-\lambda} \right|_0^\infty$$

$$= e^{0} - e^{-\infty} = 1 - 0 = 1$$

$$E[X] = \int_0^\infty x f(x) dx$$

$$= \lambda \int_0^\infty x e^{-\lambda x} dx$$

$X \sim U[0,1]$ 3

$$f(x) = \begin{cases} 0 & x < 0 \\ 1 & 0 \le x \le 1 \\ 0 & x > 1 \end{cases}$$

$$E[X] = \int_{-\infty}^{\infty} x f(x)\,dx = \int_0^1 x f(x)\,dx$$

q 1h:

F(infin) - F(1) $= \int_1^{\infty} f(x)\,dx$

old exam q3.

$$N\left[\mu = 0, \sigma = \frac{1}{\sqrt{2}}\right]$$

$$\boxed{f(x) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}}$$

$$= \frac{1}{\sqrt{\cancel{2}\pi}\;\cancel{\frac{1}{\sqrt{2}}}} e^{-x^2}$$

$$= \frac{1}{\sqrt{\pi}} e^{-x^2}$$

$$\int_{-\infty}^{\infty} \frac{1}{\sqrt{\pi}} e^{-x^2}\,dx = 1$$

$$\int_{-\infty}^{\infty} e^{-x^2}\,dx = \sqrt{\pi}$$

$$\int_{0}^{\infty} e^{-x^2}\,dx = \frac{\sqrt{\pi}}{2}$$