$\boxed{10A}$ #3

t	0	1	2	3
$P(T=t)$	$4k$	$3k$	$2k$	k
	0.4	0.3	0.2	0.1

$$4k + 3k + 2k + k = 1$$

$$k = \frac{1}{10}$$

$$P(1 \le T < 3) = P(T=1) + P(T=2)$$

$$= 0.3 + 0.2$$

$$= 0.5$$

$\boxed{10B}$ #2 $P(X \ge 2) = 3P(X<2)$

$$a + 3b = 3(2a) \qquad 3a + 3b = 1$$

$$a + 3b = 6a \qquad 3\left(\frac{3}{5}b\right) + 3b = 1$$

$$3b = 5a \qquad \frac{24}{5}b = 1$$

$$a = \frac{3}{5}b$$

$$\boxed{a = \frac{\cancel{3}}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{24}_{8}} = \frac{1}{8}} \qquad \boxed{b = \frac{5}{24}}$$

x	0	1	2	3	4	5
$P(X=x)$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{5}{24}$	$\frac{5}{24}$	$\frac{5}{24}$
$P(X \le x) \longrightarrow$	0.125	0.25	0.375	0.583		

$$E(X) = \underbrace{\tfrac{1}{8}(0) + \tfrac{1}{8}(1) + \tfrac{1}{8}(2)} + \underbrace{\tfrac{5}{24}(3) + \tfrac{5}{24}(4) + \tfrac{5}{24}(5)}$$

$$= \frac{3}{8} + \frac{60}{24} = 2.625$$

$$E(X^2) = \tfrac{1}{8}(0^2) + \tfrac{1}{8}(1^2) + \tfrac{1}{8}(2^2) + \tfrac{5}{24}(3^2) + \tfrac{5}{24}(4^2) + \tfrac{5}{24}(5^2)$$

$$= 11.0$$

$$Var(X) = E(X^2) - [E(X)]^2$$

$$= 11.042 - 2.625^2 = \underline{4.15}$$

std. dev. $\sigma = \sqrt{4.15} = 2.04$

$$\boxed{\text{median} = 2.5}$$

#5a

t	1	2	3	4	5	6	7
$P(T=t)$	k	$4k$	$9k$	$16k$	$9k$	$4k$	k
	$1/44$	$1/11$	$9/44$	$4/11$	$9/44$	$1/11$	$1/44$

$$44k = 1$$

$$k = \frac{1}{44}$$

$$P(T=4 \mid T \leq 4) = \frac{P(T=4 \cap T \leq 4)}{P(T \leq 4)} = \frac{4/11}{15/\cancel{22}_{2}}$$

$$\boxed{\text{Mode} = 4}$$

$$= \frac{8}{15}$$

$\boxed{10C}$ #2

(a) $P(L \geq 3) = 0.31 + 0.12 + 0.04 = 0.47$

(b) $E(L) = 0.07(0) + 0.21(1) + 0.25(2) + 0.31(3) + 0.12(4) + 0.04(5) = 2.32$

$$E(X^2) = 0.07(0^2) + 0.21(1^2) + 0.25(2^2) + 0.31(3^2) + 0.12(4^2) + 0.04(5^2) = 6.92$$

$$Var(X) = E(X^2) - [E(X)]^2$$

$$= 6.92 - 2.32^2 = \underline{1.54}$$

CDF

x	0	1	2	3	4	5
$P(X \le x)$	0.07	0.28	0.53	0.84	0.96	1

median = 1.5

$\boxed{10\ \text{ft}}$ ~~#~~6 $\underline{P(X>3)} = 0.555$

Find $P(X<3)$

$\boxed{m = 3.94}$

$$1 - P(X \le 3) = 0.555$$

$$1 - \text{poissoncdf}(x, 3) = 0.555$$

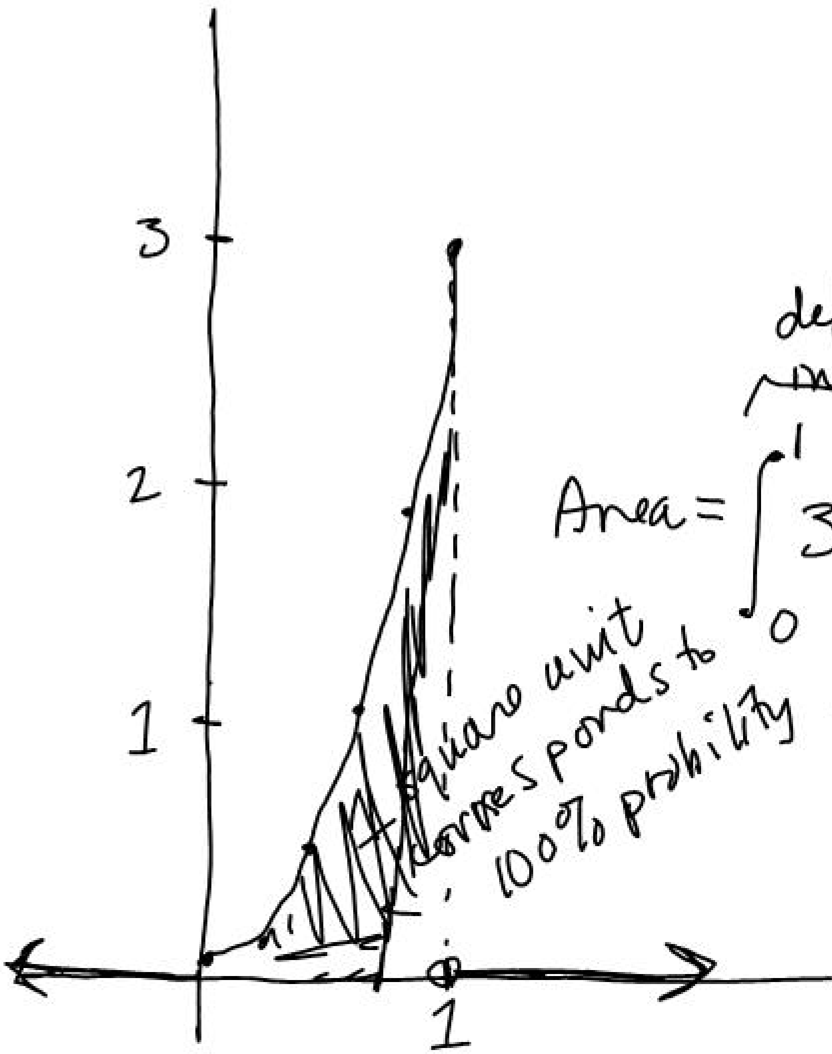
Probability Distributions

→ Discrete (finite number of outcomes or countable outcomes)

→ Continuous (outcomes lie on the number line)

Ex. $f(x) = \begin{cases} 3x^2, & 0 \le x \le 1 \\ 0, & \text{elsewhere} \end{cases}$

Is this a valid pdf. (probability density function)



$$\text{Area} = \underbrace{\int_0^1 3x^2\,dx}_{\text{definite integral}} = \left[\overset{\text{antiderivative}}{x^3} \right]_0^1$$

$$= (1)^3 - (0)^3$$

$$= 1$$

Find $P(0.1 < X < 0.2) = \int_{0.1}^{0.2} 3x^2\,dx$

$$= \left[x^3\right]_{0.1}^{0.2}$$

$$= 0.2^3 - 0.1^3 = 0.007$$

$$= \text{fnInt}(3x^2, x, 0.1, 0.2)$$

MATH $\boxed{9}$

Mean

discrete: $\sum x \cdot P(X=x)$

continuous: $\int_a^b x \cdot f(x)\,dx$

pdf

For the pdf $f(x) = 3x^2$ on $[0,1]$,

$$\mu = E(X) = \int_0^1 \underbrace{x \cdot 3x^2}_{3x^3}\,dx = \left[\frac{3}{4}x^4\right]_0^1 = \frac{3}{4}$$

Variance → discrete $E(X^2) - [E(X)]^2$

→ continuous $\int_a^b (x-\mu)^2 \cdot f(x)\, dx$

For the pdf $f(x) = 3x^2$ on $[0, 1]$.

$$\mathrm{Var}(X) = \int_0^1 (x - 3/4)^2 \cdot 3x^2\, dx$$

$$= 0.0375$$

std. dev. $\sigma = 0.194$

Mode : 1 (highest point on graph)

Median : Find m such that

$$\int_0^m f(x)\, dx = \frac{1}{2}$$

for $f(x) = 3x^2$ on $[0,1]$,

$$\int_0^m 3x^2\,dx = \left[x^3\right]_0^m = \frac{1}{2}$$

$$m^3 = \frac{1}{2}$$

$$m = \sqrt[3]{\frac{1}{2}} = \underline{\underline{0.794}}$$

<u>HW</u>

- practice quiz
- 10I #3 (use the calculator)
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