→ total prob up to a particular level of x ; Cummulative freq → total freq up to a particular level

Cumulative Probability Distribution $= F(x) = P(X \le x)$

F

Discrete random variable

| $x$ | $f(x)$ |
|---|---|
| 2 | 1/8 |
| 3 | 3/8 |
| 4 | 3/8 |
| 5 | 1/8 |

$$F(x) = P(X \le x) = \begin{cases} 0 & , x < 2 \\ 1/8 & , 2 \le x < 3 \\ \frac{1}{8} + \frac{3}{8} = \frac{4}{8} & , 3 \le x < 4 \\ \frac{1}{8} + \frac{3}{8} + \frac{3}{8} = \frac{7}{8} & , 4 \le x < 5 \\ 1 & , x \ge 5 \end{cases}$$

cover all x

$$P(X \le 3) = P(X=2) + P(X=3)$$
$$= \frac{1}{8} + \frac{3}{8} = \frac{4}{8}$$

$$P(X \le 3) = F(3) = \frac{4}{8}$$

$$P(X = 2.7) = 0$$

$$F(2.7) = P(X \le 2.7) = \frac{1}{8}$$

Continuous r.v. $\{x : 2.0001 \to 3.9999..\}$

- $f(x) = \frac{x+1}{8}, 2 < x < 4$

cum prob = total prob

$= \int f(x)dx$

For $2 \le x < 4$,

$F(x) = \int_2^x f(x)dx$

$= \int_2^x \frac{x+1}{8} dx$

$= \frac{1}{8}\int_2^x (x+1)dx$

$= \frac{1}{8}\left[\frac{1}{2}x^2 + x\right]_2^x$

$= \frac{1}{8}\left(\frac{1}{2}x^2 + x - (\frac{1}{2}(2)^2 + 2)\right)$

$= \frac{1}{8}\left(\frac{1}{2}x^2 + x - 4\right)$

total prob

$$F(x) = \begin{cases} 0 & , x < 2 \\ \frac{1}{8}\left(\frac{1}{2}x^2 + x - 4\right) & , 2 \le x < 4 \\ 1 & , x \ge 4 \end{cases}$$

$P(X \le 1.5)$

$= F(1.5) = 0$

$P(X \le 3)$

$= F(3) = \frac{1}{8}\left(\frac{1}{2}(3)^2 + 3 - 4\right) =$

$$f(x) = \begin{cases} f_1(x), & 0 \le x < 1 \\ f_2(x), & 1 \le x < 3 \end{cases}$$

include the level $x<1$

Cum prob dist

$$F(x) = \begin{cases} \underline{\quad 0 \quad}, & x < 0 \\ \underline{\qquad\qquad}, & 0 \le x < 1 \\ \underline{\qquad\qquad}, & 1 \le x < 3 \\ \underline{\quad 1 \quad}, & x \ge 3. \end{cases}$$

$\int_0^x f_1(x)\,dx$

$\underline{\int_0^x f(x)\,dx} = \underline{\int_0^1 f_1(x)\,dx} + \int_1^x f_2(x)\,dx$

$= \underline{\underline{F(1)}} + \int_1^x f_2(x)\,dx$

# Tutorial 1

a) bi,ii,iii,iv) Aaron
bv,vi) c) Cecilia

Q1. The following table gives the probability distribution of a discrete random variable $X$.

6/C

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| $P(X=x)$ | 0.03 | 0.13 | 0.22 | $K$ | 0.19 | 0.12 |

(a) Find the value of $k$.

(b) Find the following probabilities.

(i) $P(X=1)$ (ii) $P(X\leq 1)$ (iii) $P(X\geq 3)$

(iv) $P(X<3)$ (v) $P(X>3)$ (vi) $P(2\leq X\leq 4)$

(c) Find the cumulative distribution function of $X$, $F(x)=P(X\leq x)$.

1a) $0.03+0.13+0.22+k+0.19+0.12=1$ ✓

$k=1-0.69=0.31$ ✓

b) i) $P(X=1)=0.13$ ✓

ii) $P(X\leq 1)=0.13+0.03=0.16$ ✓ $P(X=1)+P(X=0)$

iii) $P(X\geq 3)=0.31+0.19+0.12=0.62$ ✓

$P(X=3)+P(X=4)+P(X=5)$

iv) $P(X<3)=0.03+0.13+0.22=0.38$ ✓

$P(X=0)+P(X=1)+P(X=2)$

$P(X=4)+P(X=5)$

v) $P(X>3)=\cancel{0.19+0.12}$
$=0.31$ ✓

vi) $P(2\leq X\leq 4)=\cancel{0.22+0.31+0.19}$ $P(X=2)+P(X=3)+P(X=4)$
$=0.72$ ✓

c) $F(x)=P(X\leq x)$

$$= \begin{cases} 0, & x<0 \\ 0.03, & 0\leq x<1 \\ 0.16, & 1\leq x<2 \\ 0.38, & 2\leq x<3 \\ 0.69, & 3\leq x<4 \\ 0.88, & 4\leq x<5 \\ 1, & x\geq 5 \end{cases}$$

OK Cai Jie

Q2 Let $X$ denote the number of auto accidents that occur in a city during a week. The following table lists the probability distribution of $X$.

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $P(X=x)$ | 0.12 | 0.16 | 0.22 | 0.18 | 0.14 | 0.12 | 0.06 |

Find the probability that the number of auto accidents that will occur during a given week in this city is

(a) exactly 4; (b) at least 3; (c) less than 3; (d) 3 to 5.

Cumulative Probability Distribution:
Pui Mun

Q2) a) $P(x=4)=0.14$

b) $P(x\geq 3)=P(x=3)+P(x=4)+P(x=5)+P(x=6)$
$=0.18+0.14+0.12+0.06$
$=0.5$

c) $P(x<3)=P(x=0)+P(x=1)+P(x=2)$
$=0.12+0.16+0.22$
$=0.50$

d) $P(3\leq x\leq 5)$
$=P(x=3)+P(x=4)+P(x=5)$
$=0.18+0.14+0.12$
$=0.44$

$$F(x)=P(X=x)=\begin{cases} 0, & x<0 \\ 0.12, & 0\leq x<1 \\ 0.16+0.12=0.28, & 1\leq x<2 \\ 0.22+0.16+0.12=0.50, & 2\leq x<3 \\ 0.18+0.22+0.16+0.12=0.68, & 3\leq x<4 \\ 0.14+0.18+0.22+0.16+0.12=0.82, & 4\leq x<5 \\ 1, & x\geq 6 \end{cases}$$

$0.82+0.12=0.94, \quad 5\leq x<6$

a) Shee Yeap

b) Khai Jun

Cumulative Probability Distribution: Jun Dian

Q3. The Webster Mail Order Company sells expensive stereos by mail. The following table lists the frequency distribution of the number of orders received per day by this company during the past 100 days.

| Number of Order Received per day | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Number of Days | 12 | 21 | 34 | 19 | 14 |

(a) Construct a probability distribution table for the number of orders received per day. Draw a graph of the probability distribution.

(b) Let $X$ denote the number of orders received on any given day. Find the following probabilities.

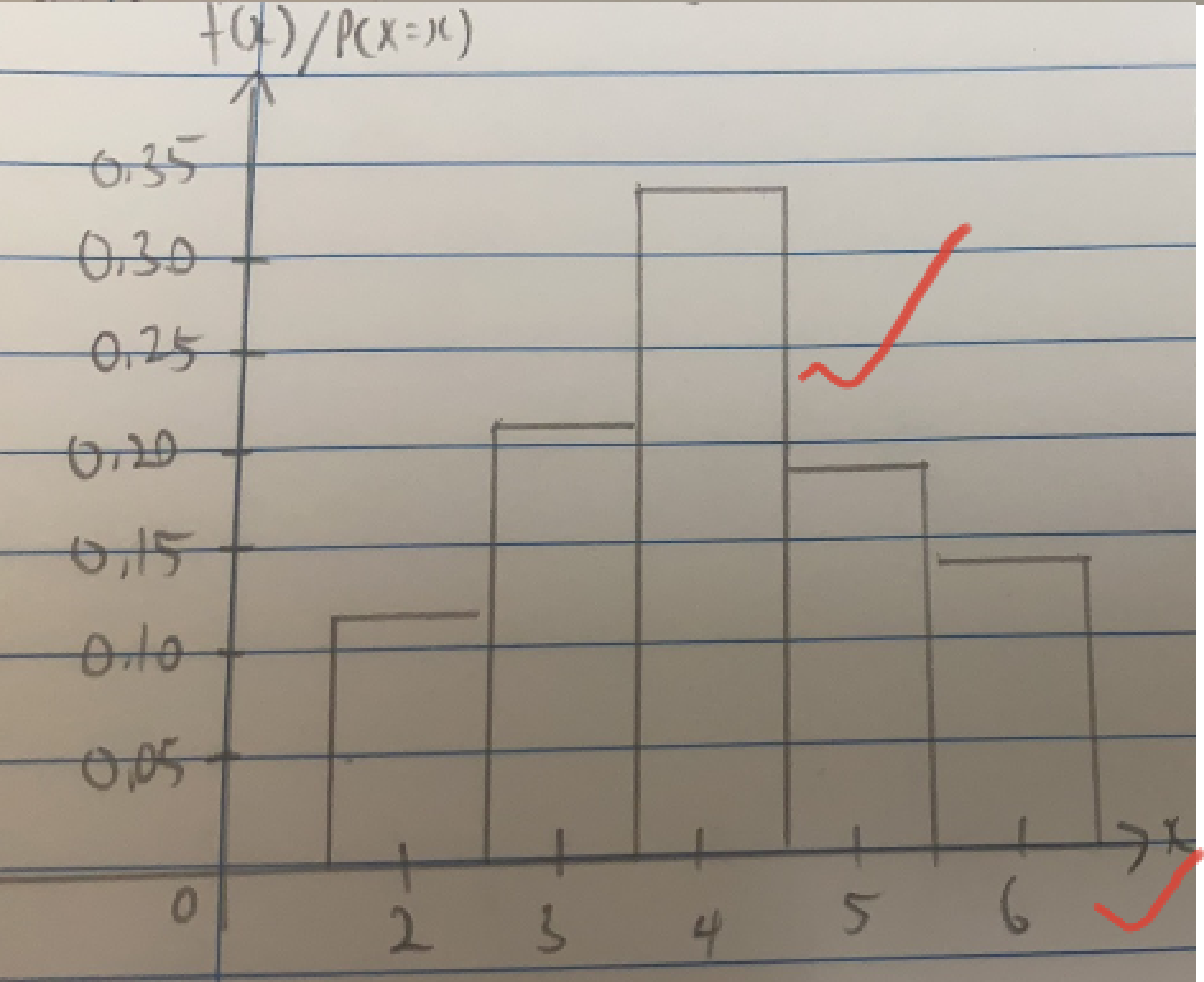
(i) $P(X=3)$ (ii) $P(X\geq 3)$

(iii) $P(2\leq X\leq 4)$ (iv) $P(X<4)$

3 (a)

| $X$ Num Of Order Received per day | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| $P(X=x)$ ~~Num Of Days~~ $f(x)$ | 0.12 | 0.21 | 0.34 | 0.19 | 0.14 |

$= \frac{\text{no of days}}{100}$




i) $P(X=3)$

$= \frac{21}{100} = 0.21$

ii) $P(X\geq 3)$

$= P(X=3)+P(X=4)+P(X=5)+P(X=6)$

$= \frac{21}{100}+\frac{34}{100}+\frac{19}{100}+\frac{14}{100}$

$= 0.88$

iii) $P(2\leq X\leq 4)$

$= P(X=2)+P(X=3)+P(X=4)$

$= \frac{12}{100}+\frac{21}{100}+\frac{34}{100}$

$= 0.67$

iv) $P(X<4)$

$= P(X=3)+P(X=2)$

$= \frac{21}{100}+\frac{12}{100}$

$= 0.33$

Cumulative Probability Distribution

$$F(x) = \begin{cases} 0, & x<2 \\ 0.12, & 2\leq x<3 \\ 0.33, & 3\leq x<4 \\ 0.67, & 4\leq x<5 \\ 0.86, & 5\leq x<6 \\ 1, & x\geq 6 \end{cases}$$

Q4. A continuous random variable $X$ that can assume values between $x = 2$ and $x = 5$ has a density function given by $f(x) = c(1 + x)$.

OK

(a) Find the value of $c$.

(b) Find $P(X < 4)$ and $P(3 \leq X < 4)$.

(c) Find the cumulative distribution function of $X$, $F(x) = P(X \leq x)$.

a)b) P(X< 4) Chun Wai

b) P(3<=X<4) c) Jing Xian

(a)

$$\int_2^5 f(x)\,dx = 1$$

$$\int_2^5 c(1+x)\,dx = 1$$

$$c\left[x + \frac{x^2}{2}\right]_2^5 = 1$$

$$c\left(\left(5 + \frac{5^2}{2}\right) - \left(2 + \frac{2^2}{2}\right)\right) = 1$$

$$c(17.5 - 4) = 1$$

$$13.5c = 1$$

$$c = \frac{2}{27}$$

(b)

$$P(X < 4)$$

$$= \int_2^4 \frac{2}{27}(1+x)\,dx$$

$$= \frac{2}{27}\left[x + \frac{x^2}{2}\right]_2^4$$

$$= \frac{2}{27}\left(4 + \frac{4^2}{2} - 2 + \frac{2^2}{2}\right)$$

$$= \frac{2}{27}(4 + 8 - 2 + 2)$$

$$= \frac{2}{27}(8)$$

$$= \frac{16}{27}$$

$$P(3 \leq X < 4) = \frac{2}{27}\int_3^4 (1+x)\,dx$$

$$= \frac{2}{27}\left[x + \frac{x^2}{2}\right]_3^4$$

$$= \frac{2}{27}\left[\left(12 - \frac{15}{2}\right)\right]$$

$$= \frac{1}{3}$$

(c)

$$\text{(c) } F(x) = \begin{cases} 0 & x < 2 \\ \frac{2}{27}\left(x + \frac{x^2}{2} - 4\right) & 2 \leq x < 5 \\ 1 & x \geq 5 \end{cases}$$

For $2 \leq x < 5$,

$$F(x) = \frac{2}{27}\int_2^x (1+x)\,dx$$

$$= \frac{2}{27}\left[x + \frac{x^2}{2}\right]_2^x$$

$$= \frac{2}{27}\left[\left(x + \frac{x^2}{2}\right) - 4\right] = \frac{2}{27}\left(x + \frac{x^2}{2} - 4\right)$$

Q5. The density function of the continuous random variable $X$, the total number of hours, in units of 100 hours, that a family runs a vacuum cleaner over a period of one year, is given in

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

(a) Show that $P(0<X<2)=1$.

(b) Find $P(X<1.2)$.

(c) Find the cumulative distribution function of $X$, $F(x)=P(X\le x)$.

ok

$\left[\frac{x^2}{2}\right]_0^1 = \frac{1^2}{2} - \frac{0^2}{2} = \frac{1}{2}$

a) b) Janet

c) Jia Yu

$\left[2x-\frac{x^2}{2}\right]_1^x = 2x-\frac{x^2}{2} - (2(1) - \frac{1^2}{2})$

Q5. A. $\int_0^1 f(x)\,dx = \int_0^1 x\,dx$

$= \left[\frac{x^2}{2}\right]_0^1$

$= \frac{1}{2}$

$\int_1^2 f(x)\,dx = \int_1^2 (2-x)\,dx$

$= \left[2x - \frac{x^2}{2}\right]_1^2$

$= \left[(2(2) - \frac{2^2}{2}) - (2(1) - \frac{1^2}{2}\right.$

$= \frac{1}{2}$

$P(0<x<2) = \sum f(x) = \frac{1}{2} + \frac{1}{2}$

$= 1$ (shown)

B. $P(X<1.2) = \int_1^{1.2} f(x)\,dx + \int_0^1 f(x)\,dx$

$= \int_1^{1.2} (2-x)\,dx + \int_0^1 x\,dx$

$= \left[2x - \frac{x^2}{2}\right]_1^{1.2} + \left[\frac{x^2}{2}\right]_0^1$

$= \left[(2(1.2) - \frac{(1.2)^2}{2}) - (2(1) - \frac{1^2}{2})\right] + \left[(\frac{1^2}{2}) - (\frac{0^2}{2})\right]$

$= 0.18 + 0.5$

$= 0.68$

For $0\le x<1$,

$F(x) = \int_0^x x\,dx$

$= \left[\frac{x^2}{2}\right]_0^x$

$= \left[\frac{x^2}{2} - \frac{0^2}{2}\right]$

$= \frac{x^2}{2}$

For $1\le x<2$,

$F(x) = \int_0^1 x\,dx + \int_1^x (2-x)\,dx$

$= \left[\frac{x^2}{2}\right]_0^1 + \left[2x - \frac{x^2}{2}\right]_1^x$

$= (\frac{1}{2}) + \left[(2-\frac{1}{2}) - (2x - \frac{x^2}{2})\right]$

$= \frac{1}{2} + 2x - \frac{1}{2}x^2 - \frac{3}{2}$

$= 2x - \frac{1}{2}x^2 - 1$

$$F(x) = \begin{cases} 0 & x<0 \\ \frac{1}{2}x^2 & 0\le x<1 \\ 2x-\frac{1}{2}x^2-1, & 1\le x<2 \\ 1 & x\ge 2 \end{cases}$$

Q6. Let $X$ be a random variable with the following probability distribution:

Jing Jet

| $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $P(X=x)$ | 8/27 | 4/9 | 2/9 | 1/27 |

Find the mean and variance of $X$

Cumulative Probability Distribution:
Jia Jie

$$\text{mean} = \sum x P(x)$$
$$= (0 \times \tfrac{8}{27}) + 1(\tfrac{4}{9}) + 2(\tfrac{2}{9}) + 3(\tfrac{1}{27})$$
$$= 1$$

$$\sigma^2 = \sum x^2 P(x) - \mu^2$$
$$= 0^2(\tfrac{8}{27}) + 1^2(\tfrac{4}{9}) + 2^2(\tfrac{2}{9}) + 3^2(\tfrac{1}{27}) - 1^2$$
$$= \tfrac{2}{3}$$

$$F(x) = \begin{cases} 0, & x < 0 \\ \frac{8}{27}, & 0 \le x < 1 \\ \frac{20}{27}, & 1 \le x < 2 \\ \frac{26}{27}, & 2 \le x < 3 \\ 1, & x \ge 3 \end{cases}$$

ok.

Q7. Let $X$ be a random variable with the following probability distribution:

Jun Yan

| $x$ | -2 | 3 | 5 |
|---|---|---|---|
| $P(X=x)$ | 0.3 | 0.2 | 0.5 |

Find the mean and standard deviation of $X$.

Q7. mean $= -2(0.3)+3(0.2)+5(0.5)$

$= -0.6+0.6+2.5$

$\mu = 2.5$ ※

| x | $x^2$ |
|---|---|
| -2 | 4 |
| 3 | 9 |
| 5 | 25 |

standard deviation $= \sqrt{[4(0.3)+9(0.2)+25(0.5)]-(2.5)^2}$ $\sum x^2 P(X=x)-\mu^2$

$= \sqrt{15.5-6.25}$

$\sigma = 3.0414$ ※

Cumulative Probability Distribution: Mei Yi

Q7.

$$P(X \le x) = \begin{cases} 0, & x < -2 \\ 0.3, & -2 \le x < 3 \\ 0.5, & 3 \le x < 5 \\ 1, & x \ge 5 \end{cases}$$

OK Q8. By investing in a particular stock, a person can make a profit in 1 year of RM4,000 with probability of 0.3 or take a loss of RM1,000 with probability 0.7. What is this person's expected gain? Calculate the standard deviation for the distribution of gain.

Yee Hao

X = gain

| | $X$ | $P[X=x]$ |
|---|---|---|
| profit | +4000 | 0.3 |
| loss | -1000 | 0.7 |

$E(X) = 4000(0.3) + (-1000)(0.7)$

$= 1200 - 700$

$= RM500$

$\therefore$ On average, the person will gain RM500 in a year.

TQ!

$\sigma = \sqrt{5500000 - 250000}$

$= \sqrt{5250000}$

$= 2291.2878$ (RM)

02

Q9. In a gambling game a woman is paid \$3 if she draws a jack or a queen and \$5 if she draws a king or an ace from an ordinary deck of 52 playing cards. If she draws any other card, she loses. How much should she pay to play if the game is fair?

4J 4Q 4K 4A

Eason

$= \sqrt{(-2)^2(0.3) + 3^2(0.2) + 5^2(0.5) - 2.5^2}$

$= 3.0414$

9.

X = gain

| $x$ | $f(x)$ |
| --- | --- |
| $+3$ | $\frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$ |
| $+5$ | $\frac{2}{13}$ $\frac{4}{52} + \frac{4}{52}$ |
| $+0$ | $\frac{9}{13} = 1 - \frac{2}{13} - \frac{2}{13}$ |

$C = \mu = \sum x f(x)$

$= +3(\frac{2}{13}) + 5(\frac{2}{13}) + 0(\frac{9}{13})$

$= \frac{16}{13}$

She should pay 16/13 dollar to play the game

Let $c$ be the amount she pay to play.

If the game is fair,

$c = E(X)$

Q10.

Shen Ho

... of efficiency ... sity

2b) $\int_1^2 2(x-1)\,dx$

$\mu = E(x) = \int_{-\infty}^{\infty} x f(x)\,dx$

E(X) $= \int_1^2 (x)(2)(x-1)\,dx$

$= \int_1^2 (2x^2 - 2x)\,dx$

$= \left[\frac{2x^3}{3} - x^2\right]_1^2$

$= \left[\frac{2(2)^3}{3} - (2)^2\right] - \left[\frac{2(1)^3}{3} - 1^2\right]$

$= \frac{5}{3}$

$\sigma^2 = \int_{-\infty}^{\infty} x^2 f(x)\,dx - \mu^2$

$= \int_1^2 (x^2)(2)(x-1)\,dx - \left(\frac{5}{3}\right)^2$

$= \int_1^2 2x^3 - 2x^2\,dx - \left(\frac{5}{3}\right)^2$

$= \left[\frac{x^4}{2} - \frac{2x^3}{3}\right]_1^2 - \left(\frac{5}{3}\right)^2$

$= \left[\frac{2^4}{2} - \frac{2(2)^3}{3}\right] - \left[\frac{1^4}{2} - \frac{2(1)^3}{3}\right] - \left(\frac{5}{3}\right)^2$

$= \frac{1}{18}$

Cumulative Probability Distribution: Sean

$$f(x) = \begin{cases} 2(x-1), & 1 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

$$F(x) = \begin{cases} 0, & x < 1 \\ x^2 - 2x + 1, & 1 \le x < 2 \\ 1, & x \ge 2 \end{cases}$$

For $1 \le x < 2$,

$F(x) = \int_1^x 2(x-1)\,dx$

$= 2\left(\frac{x^2}{2} - x\right)_1^x$

$= 2\left[\left(\frac{x^2}{2} - x\right) - \left(\frac{1}{2} - 1\right)\right]$

$= 2\left[\left(\frac{x^2}{2} - x\right) + \frac{1}{2}\right]$

$= x^2 - 2x + 1$

Kang Hong

Cumulative Probability Distribution: Li Yuet

Q11. What proportion of individuals can be expected to respond to a certain mail-order solicitation if the proportion $X$ has the density function

$$f(x) = \begin{cases} \frac{2}{5}(x+2), & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}.$$

Hence, find the mean and variance of people who respond to a certain mail-order solicitation.

11. $\mu = \frac{2}{5}\int_0^1 x(x+2)\,dx$

$= \frac{2}{5}\left[\frac{x^3}{3} + \frac{2x^2}{2}\right]_0^1$

$= \frac{2}{5}\left[\left(\frac{1}{3}+1\right) - 0\right]$

$= \frac{2}{5}\left(\frac{4}{3}\right)$

$= \frac{8}{15}$

$\sigma^2 = \frac{2}{5}\int_0^1 (x^3+2x^2)\,dx - \mu^2$

$= \frac{2}{5}\left[\frac{x^4}{4} + \frac{2x^3}{3}\right]_0^1 - \left(\frac{8}{15}\right)^2$

$= \frac{2}{5}\left[\frac{1}{4} + \frac{2}{3}\right] - \left(\frac{64}{225}\right)$

$= \frac{11}{30} - \frac{64}{225}$

$= \frac{37}{450}$

For $0 \le x < 1$

$\int_0^x \frac{2}{5}(x+2)\,dx = \frac{2}{5}\int_0^x (x+2)\,dx$

$= \frac{2}{5}\left[\frac{x^2}{2} + 2x\right]_0^x$

$= \frac{2}{5}\left[\left(\frac{x^2}{2} + 2x\right) - \left(\frac{0^2}{2} + 2(0)\right)\right]$

$= \frac{2}{5}\left[\frac{x^2}{2} + 2x\right]$

$= \frac{x^2}{5} + \frac{4}{5}x$

$$f(x) = \begin{cases} 0, & x < 0 \\ \frac{x^2}{5} + \frac{4}{5}x, & 0 \le x < 1 \\ 1, & x \ge 1 \end{cases}$$

Q12. The density function of the continuous random variable $X$, the total number of hours, in units of 100 hours, that a family runs a vacuum cleaner over a period of one year, is given in

6/6

Mavis

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

(a) Find the average number of hours per year that families run their vacuum cleaners.

(b) Find the variance of $X$.

$$(a)\quad E(X) = \int_0^1 x^2\,dx + \int_1^2 x(2-x)\,dx$$
$$= \left[\frac{x^3}{3}\right]_0^1 + \left[\frac{2x^2}{2} - \frac{x^3}{3}\right]_1^2$$
$$= \left[\frac{1^3}{3} - 0\right] + \left[\frac{2(2)^2}{2} - \frac{2^3}{3} - \left(\frac{2(1)^2}{2} - \frac{1^3}{3}\right)\right]$$
$$= \frac{1}{3} + \frac{2}{3}$$
$$= 1 \text{ ~~hour~~ } (100 \text{ hours})$$

$$(b)\quad Var(X) = E(X^2) - [E(X)]^2$$
$$= \int_0^1 x^3\,dx + \int_1^2 x^2(2-x)\,dx - 1^2$$
$$= \left[\frac{x^4}{4}\right]_0^1 + \left[\frac{2x^3}{3} - \frac{x^4}{4}\right]_1^2 - 1$$
$$= \left[\frac{1^4}{4} - 0\right] + \left[\frac{2(2)^3}{3} - \frac{2^4}{4} - \left(\frac{2(1)^3}{3} - \frac{1^4}{4}\right)\right] - 1$$
$$= \frac{1}{4} + \frac{11}{12} - 1$$
$$= \frac{1}{6} \quad (100 \text{ hours})^2$$

## Q12) Cumulative Probability Distribution: Ze Xuan

Cumulative Probability Distribution

$$F(x) = P(X \le x) = \begin{cases} 0, & x < 0 \\ \frac{1}{2}x^2, & 0 \le x < 1 \\ 2x - \frac{x^2}{2} - 1, & 1 \le x < 2 \\ 1, & x \ge 2 \end{cases}$$

For $0 \le x < 1$,

$$F(x) = \int_0^x f(x)\,dx = \int_0^x x\,dx = \frac{1}{2}\int_0^x x^2\,dx = \frac{1}{2}\left[x^2\right]_0^x = \frac{1}{2}\left[(x^2) - 0\right] = \frac{1}{2}x^2$$

For $1 \le x < 2$,

$$F(x) = \int_0^x f(x)\,dx = \int_0^1 x\,dx + \int_1^x 2-x\,dx = \left[\frac{x^2}{2}\right]_0^1 + \left[2x - \frac{x^2}{2}\right]_1^x = \frac{1}{2} + \left(2x - \frac{x^2}{2}\right) - \left(2 - \frac{1}{2}\right) = 2x - \frac{x^2}{2} - 1$$

Based on the cumulative probability distribution, calculate the probability of

a) $P(X<0.5)$

b) $P(0.9 < X < 1.2)$

c) $P(X > 1.5) = 1 - P(X<1.5) = 1 - F(1.5)$
$= 1 - 0.875$

Yu Hong

a) $P(x < 0.5) = \frac{1}{2}(0.5)^2 = F(0.5)$
$= 0.125$

$F(1.2) - F(0.9)$

b) $P(0.9 < x < 1.2) = 2(1.2) - \frac{(1.2)^2}{2} - 1 - \frac{1}{2}(0.9)^2$
$= (0.68 - 0.405)$
$= 0.275$

c) $P(x \ge 1.5) = 2(1.5) - \frac{(1.5)^2}{2} - 1$
$F(1.5)$
$= 0.875$