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3.6

$$f(x) = \begin{cases} \dfrac{20000}{(x+100)^3} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

(a) $P(X > 200) = \int_{200}^{\infty} \frac{20000}{(x+100)^3}\,dx$

$= 20000\left(-\frac{1}{2}\frac{1}{(x+100)^2}\Big|_{200}^{\infty}\right)$

$= 20000\left(0-\left(-\frac{1}{2}\frac{1}{300^2}\right)\right) = \frac{1}{9}$

(b)

$P(80 < X < 120) = \int_{80}^{120} \frac{20000}{(x+100)^3}\,dx$

$= 20000\left(-\frac{1}{2}\frac{1}{(x+100)^2}\Big|_{80}^{120}\right)$

$= 20000\left(-\frac{1}{2}\frac{1}{48400} + \frac{1}{2}\frac{1}{32400}\right)$

$= \frac{484-324}{484 \times 324} \times 100 = \frac{1000}{9801} = 0.102$

3.16

① 3.11

X = # of defective

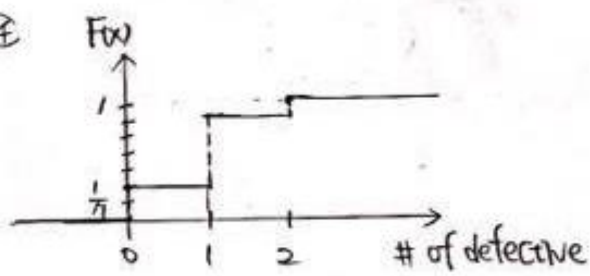
$f(x) = \frac{C^2_x C^5_{3-x}}{C^7_3}$

F(0)=f(0)=2/7

F(1)=f(0)+f(1)=2/7+4/7=6/7

F(2)=f(0)+f(1)+f(2)=6/7+1/7=1

②



3.24 X = # of comic books $x=0,1,2,3,4$

all = $5+2+3=10$

x	0	1	2	3	4
$f(x)$	$\frac{C^5_4}{C^{10}_4}$	$\frac{C^5_1 C^5_3}{C^{10}_4}$	$\frac{C^5_2 C^5_2}{C^{10}_4}$	$\frac{C^5_3 C^5_1}{C^{10}_4}$	$\frac{C^5_4}{C^{10}_4}$

$$f(x) = \frac{C^5_x C^5_{4-x}}{C^{10}_4} = \frac{\binom{5}{x}\binom{5}{4-x}}{\binom{10}{4}} \quad x=0,1,2,3,4$$

3.36

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

(a) $P(X<0.5) = \int_{-\infty}^{0.5} f(x)\,dx = 2\int_0^{0.5} (1-x)\,dx$

$= 2\left(x - \frac{1}{2}x^2 \Big|_0^{0.5}\right) = \frac{3}{4}$

(b) $P(X>0.4) = \int_{0.4}^{\infty} f(x)\,dx = 2\int_{0.4}^{1} (1-x)\,dx$

$= 2\left(x - \frac{1}{2}x^2 \Big|_{0.4}^{1}\right) = 0.36$

(C)

$P(X<0.7 \mid X \geq 0.5) = \frac{P(0.5 \leq X < 0.7)}{P(X \geq 0.5)} = \frac{\left(2x - x^2 \Big|_{0.5}^{0.7}\right)}{1-\frac{3}{4}}$

$= \frac{\frac{4}{25}}{\frac{1}{4}} = \frac{16}{25}$

3.40 X = time that drive-in Y = time that walk-in

$$f(x,y) = \begin{cases} \frac{2}{3}(x+2y) & 0 \le x \le 1,\ 0 \le y \le 1 \\ 0 & \text{elsewhere} \end{cases}$$

(a) $g(x) = \int_{-\infty}^{\infty} \frac{2}{3}(x+2y)\,dy = \frac{2}{3}\int_0^1 (x+2y)\,dy$

$= \frac{2}{3}\left(xy + y^2\Big|_0^1\right) = \frac{2}{3}(x+1) \quad 0 \le x \le 1$

(b) $h(y) = \int_{-\infty}^{\infty} \frac{2}{3}(x+2y)\,dx = \frac{2}{3}\left(\frac{1}{2}x^2 + 2yx\right)\Big|_0^1$

$= \frac{2}{3}\left(2y + \frac{1}{2}\right) = \frac{1}{3}(4y+1) \quad 0 \le y \le 1$

3.40

(c) $P(X < 0.5) = \int_{-\infty}^{0.5} g(x)\,dx = \frac{2}{3}\int_0^{0.5}(x+1)\,dx$

$= \frac{2}{3}\left(\frac{1}{2}x^2 + x\Big|_0^{0.5}\right) = \frac{5}{12}$

3.50

$f(x,y)$		x = 2	x = 4
	1	0.10	0.15
y	3	0.20	0.30
	5	0.10	0.15

x	2	4
$g(x)$	0.40	0.60

$g(2) = \sum_y f(2,y) = f(2,1) + f(2,3) + f(2,5) = 0.40$

$g(4) = \sum_y f(4,y) = f(4,1) + f(4,3) + f(4,5) = 0.60$

y	1	3	5
$h(y)$	0.25	0.50	0.25

$h(1) = \sum_x f(x,1) = f(2,1) + f(4,1) = 0.25$

$h(3) = \sum_x f(x,3) = f(2,3) + f(4,3) = 0.50$

$h(5) = \sum_x f(x,5) = f(2,5) + f(4,5) = 0.25$