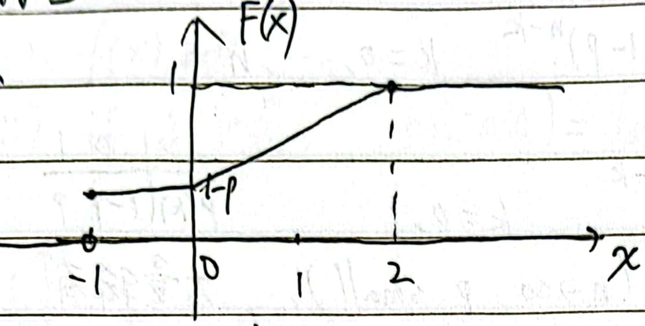
HW 3

Ex.

2.2



(a) $P(X=-1)=F(-1)-F(-1^-)=1-p$

(b) $P(X=0)=F(0)-F(0^-)=0$

(c) $P(X>1)=1-P(X\le 1)=1-F(1)=1-(1-p+\frac{1}{2}p)=\frac{1}{2}p$

2.4

(a) $P(\frac{1}{2}\le X\le\frac{3}{2})=F(\frac{3}{2})-F(\frac{1}{2}^-)=\frac{3}{4}-\frac{1}{6}=\frac{9-2}{12}=\frac{7}{12}$

(b) $P(\frac{1}{2}\le X\le 1)=F(1)-F(\frac{1}{2}^-)=\frac{1}{2}-\frac{1}{6}=\frac{1}{3}$

(c) $P(\frac{1}{2}\le X<1)=F(1^-)-F(\frac{1}{2}^-)=\frac{1}{3}-\frac{1}{6}=\frac{1}{6}$

(d) $P(1\le X\le\frac{3}{2})=F(\frac{3}{2})-F(1^-)=\frac{3}{4}-\frac{1}{3}=\frac{5}{12}$

(e) $P(1<X<2)=F(2^-)-F(1)=1-\frac{1}{2}=\frac{1}{2}$

2.6

If we have head ~~on the~~ for r th trial in the n times, there will be r head, n-r back, and the n th trial must be head.

$\therefore P(X=n)=C_{n-1}^{r-1}\cdot p^r(1-p)^{n-r}$

2.7

possible value of X can be 0, 1, 2, 3

$P(X=0)=C_3^0\,0.7^0\,0.3^3=0.027$

$P(X=1)=C_3^1\,0.7^1\,0.3^2=0.189$

$P(X=2)=C_3^2\,0.7^2\,0.3^1=0.441$

$P(X=3)=C_3^3\,0.7^3\,0.3^0=0.343$

2.8 $\sum_{k=1} P(X_k) = 1 \Rightarrow \frac{a}{8}\times 2 + \frac{a}{4} = 1 \Rightarrow \frac{a}{2} = 1$

$a = 2$

2.10

$P(X=0) = F(0) - F(0^-) = \frac{1}{2}$ $\quad P(X=1) = F(1) - F(1^-) = \frac{1}{10}$

$P(X=2) = F(2) - F(2^-) = \frac{1}{5}$ $\quad P(X=3) = F(3) - F(3^-) = \frac{1}{10}$

$P(X=3.5) = \frac{1}{10}$

$\therefore$ p.f. is

X	0	1	2	3	3.5
$p(x)$	$\frac{1}{2}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{10}$

2.11

$F(0) = P(X \le 0) = \int_{-1}^{0} f(x)dx = \frac{8}{3}\int_{-1}^{0}(1-2x+x^2)dx$

$= \frac{8}{3}\cdot\left(x - x^2 + \frac{x^3}{3}\right)\Big|_{-1}^{0} = \frac{8}{3}\cdot -\left(-1-1-\frac{1}{3}\right) = \frac{64}{9}$

2.13

(a) $\int_{-\infty}^{+\infty} f(x)dx = 1$

$\Rightarrow \int_0^1 cx^n dx = 1 \Rightarrow c\cdot\frac{1}{n+1} = 1 \quad c = n+1$

(b) $P(X>x) = 1 - F(x) = 1 - \int_0^x f(t)dt = 1 - \int_0^x (n+1)t^n dt$

$= 1 - t^{n+1}\Big|_0^x = 1 - x^{n+1}$

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