YEAR 12

IARTV TEST — OCTOBER 1998

MATHEMATICAL METHODS CAT 3

ANSWERS & SOLUTIONS

1.

1) $(-\infty,3)$

2) $(\log_e \frac{5}{3},0),(0,-2)$

3) $-\frac{e}{5}$

4) $f^{-1}:(-\infty,3)\to R$ where

$f^{-1}(x)=\log_e \frac{5}{3-x}$

5) $x=2.8$

2

1) $pr(win)=\frac{16}{27}$

2) $E(wins)=9$

$\hat{p}$ = *proportion of wins*

3) $E(\hat{p})=\frac{2}{3}, Var(\hat{p})=\frac{2}{135}$

$0.423\le\hat{p}\le0.910$

4) *The proportion of wins is 0.444 which is within the confidence interval: so the result is not significant at this level.*

5) $Pr(4\,wins)={}^9C_4 0.6^4 0.4^5=0.1672$

6) $Pr(0,1,2\,wins)=0.4^9+{}^9C_1 0.6^1 0.4^8+{}^9C_2 0.6^2 0.4^7$

$=0.025$

7) $Pr={}^4C_2 0.6^2 0.4^2 \cdot {}^3C_1 0.3^1 0.7^2=0.1524$

3.

1) a=0

2) b=1

3) c=0

4) d=-1/6

5) *Both curves pass through the origin and have the same gradient at the origin.*

6) *Difference=0.013*

7) $h(x)=f(2x)=2x-\frac{4x^3}{3}$

8) $B(\sqrt{2},\frac{2\sqrt{2}}{3}), D(\sqrt{6},0)$

9) $\int_0^{\frac{\pi}{2}}\sin x-(x-\frac{x^3}{6})dx=0.020$

10) $\int_{0.5}^{1}x(x-\frac{x^3}{6})dx=\frac{249}{960}=0.2594$

11) $\frac{d}{dx}(x\cos x)=\cos x-x\sin x$

$\int x\sin x\,dx=\sin x-x\cos x+c$

4.

1) *k=.001=l, m=10*

2) *gradient=0.1*

3) *gradient=0.2=tanQ*

Q=11.3°

4) *h=-0.1x+70*

5) *Furthest distance=618.6km*

6) $m=5,\ n=\frac{\pi}{350}$