Outcome 3 Data (9 Marks)

START A NEW PAGE

Section 1 Select the correct alternative A, B, C or D

1) The square represents a missing digit in the stem and leaf plot.
Given the median is 45, what does □ represent

STEM	LEAF
3	7 8 9
4	□ 8
5	1 3 7

(A) 0 (B) 2 (C) 4 (D) 5 1 Mark

2) The total of four scores is twenty. A score is added and the new mean is five.
The score that was added was

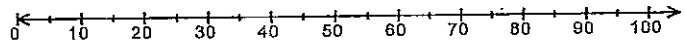
(A) 4 (B) 4·5 (C) 5 (D) 5·5 1 Mark

3) A normal distribution has a mean of 70 and a standard deviation of 5.
What percentage of scores are between 65 and 75?

(A) 50% (B) 79% (C) 68% (D) 95 1 Mark

Section 2 Show all working

4) Copy the diagram



Draw a box and whisker plot given the following information.

Highest score = 80
Lowest score = 25
Lower quartile = 50
Upper quartile = 70
Median = 65

1 Mark

5) Given the following scores 61, 52, 57, 48, 65, 55 find the standard deviation correct to one decimal place. 1 Mark

6) Find the inter-quartile range of the following scores.

9, 1, 11, 2, 10, 11, 2, 10, 5, 7, 11, 11. 1 Mark

Section 3 Show all working

7) The following statistics were obtained from a Mathematics and English test

	$\bar{x}$	σ	Brian's Mark
Maths	60	9	40
English	50	13	40

(i) Brian said "I scored better in Mathematics". Do you agree?
Use the information in the table to justify your response. 2 Marks

(ii) The teacher had forgotten to include the mark of 59 when calculating the statistics for Mathematics. In what way would the mean and standard deviation for Mathematics be affected once the score was included?

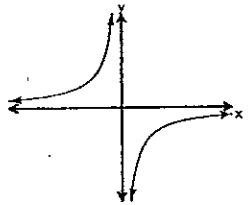
1 Mark

Outcome 4 Graphs (20 Marks)

START A NEW PAGE

Section 1 Select the correct alternative A, B, C or D

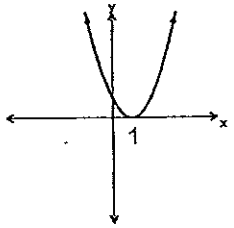
1) Select the equation which matches the graph below.



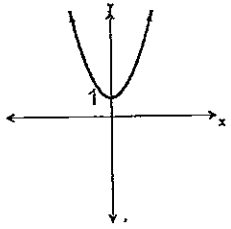
(A) $xy = 4$ (B) $y = \frac{-4}{x}$ (C) $x^2 + y^2 = 4$ (D) $y = 4x$ 1 Mark

2) The graph that represents $y=(x+1)^2$ is 1 Mark

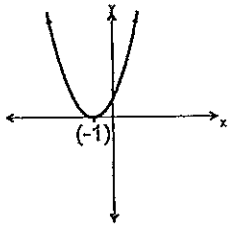
(A)



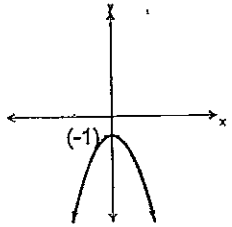
(B)



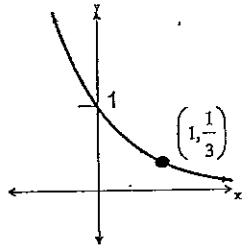
(C)



(D)



3) The equation of the graph below is



(A) $y=3^x$ (B) $y=-3^x$ (C) $y=3^{-x}$ (D) $y=-3^{-x}$ 1 Mark

Section 2 Show all working

4) A parabola has the equation $y=x^2-7x+10$.

(i) Find the y-intercept. 1 Mark

(ii) Find the x-intercepts. 1 Mark

(iii) Find the equation of the axis of symmetry. 1 Mark

(iv) Find the co-ordinates of the vertex 1 Mark

(v) Find the minimum value. 1 Mark

(vi) Sketch the curve showing all the above details. 1 Mark

5) Sketch the following curves, showing all essential features.

(i) $x^2+y^2=4$ 2 Marks

(ii) $y=\dfrac{1}{x+4}$ 2 Marks

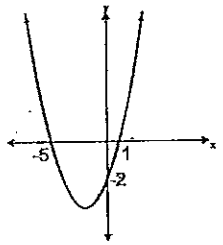
6) Explain what happens to the curve $y=x^3$ when the following translations are performed.

(i) $y=x^3-1$ 1 Mark

(ii) $y=(x-1)^3$ 1 Mark

Section 3 Show all working

7) Use the sketch to find the equation of the following parabola



3 Marks

8) Find the centre and radius of the semi-circle $y=-\sqrt{28-x^2}$ 2 Marks
Give your answer in simplest form.

Outcome 5 Polynomials (20 Marks)

START A NEW PAGE

Section 1 Select the correct alternative A, B, C or D

1) Which of the following is a polynomial? 1 Mark

(A) $\frac{9x^3+x^2+x^5}{x}$ (B) $4x+2\sqrt{x}$

(C) x^2-2x+3^x (D) $\frac{5}{x^2}+\frac{12}{x^3}+x$

2) Given $P(x)=3x-6x^4-5+2x^2$, the leading term is: 1 Mark

(A) $3x$ (B) $-6x^4$

(C) 3 (D) -5

3) Which of the following is a factor of $x^3-x^2-10x-8$ 1 Mark

(A) $(x-1)$ (B) $(x-2)$ (C) $(x+4)$ (D) $(x+1)$

Section 2 Show all working

4) Find the value of k if $2x^3+6x^2-3x+k$ is divided by $(x-1)$ and the remainder is 6. 1 Mark

5) If $P(x)=x^2-16$, solve $P(x)=0$ 1 Mark

6) Given $P(x)=2x^4-17x^2-3$ and $Q(x)=x^2+4x+3$
Find $P(x)\div Q(x)$ and write your answer in the form $P(x)=A(x)Q(x)+R(x)$ 2 Marks

7) Sketch the following showing all the intercepts.

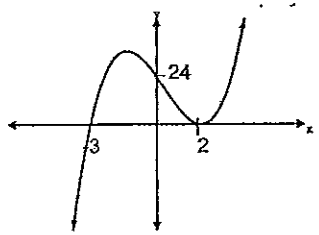
(i) $y=x(x-3)(x+3)$ 2 Marks

(ii) $y=(x-2)^2(x+1)^3$ 2 Marks

8) Solve $x^3+2x^2-13x+10=0$ 4 Marks

Section 3 Show all working

9) Find the equation of this polynomial $P(x)$ of degree 3. Leave your answer in factorised form.



2 Marks

10) A polynomial is given by $P(x)=x^3+ax^2+bx-18$. Find a and b if $(x+2)$ is a factor and -24 is the remainder when divided by $(x-1)$ 2 Marks

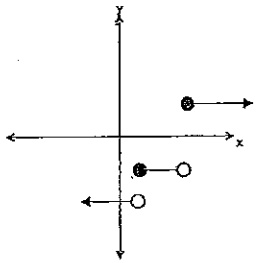
Outcome 6 Functions and Logarithms (20 Marks)

START A NEW PAGE

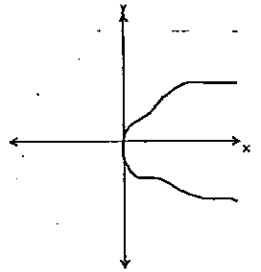
Section 1 Select the correct alternative A, B, C or D

1) Which of the following are functions? 1 Mark

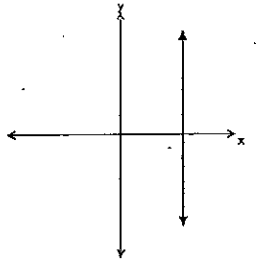
(A)



(B)



(C)



(D)

x	2	3	4	1
$f(x)$	5	7	9	5

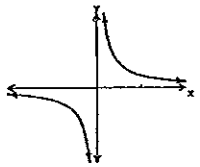
2) Given $16 = 4^2$, which of the following are true? 1 Mark

(A) $\log_4 16 = 2$ (B) $\log_2 4 = 16$

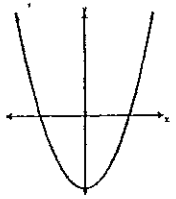
(C) $\log_{16} 2 = 4$ (D) $\log_{16} 4 = 2$

3) Which of the following graphs represent functions whose inverse is a function 1 Mark

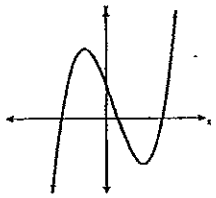
(A)



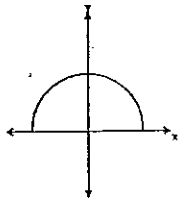
(B)



(C)



(D)



Section 2 Show all working

4) Given $f(x) = \dfrac{x+1}{x-1}$

(i) Evaluate $f\left(\dfrac{1}{2}\right)$ 1 Mark

(ii) Solve $f(x) = \dfrac{1}{2}$ 1 Mark

5) Evaluate $27^x = \dfrac{1}{9}$ 1 Mark

6) Simplify (i) $\dfrac{\log_a 16}{\log_a 2}$ 1 Mark

(ii) $5\log_8 2 + \dfrac{1}{2}\log_8 4$ 2 Marks

7) Given $\log 2 = 0.$ and $\log 3 = 0.4771$

Evaluate (i) $\log_{10} 6$ 1 Mark

(ii) $\log 1.5$ 1 Mark

(iii) $\log 24$ 2 Marks

8) Solve (i) $2^{x-3} = 47$ 2 Marks

(ii) $\log_x \dfrac{1}{4} = 2$ 1 Mark

Section 3 Show all working

9) Solve $\log x + \log (x-2) = 3 \log 2$ 3 Marks

END OF TEST

SOLUTIONS [Yr 10 Newington 2006]

OUTCOME 1 — Section 1 —

1) (A) 2) B 3) A 4) A

— Section 2 —

3) $\frac{\sin\theta}{10} = \frac{\sin 34}{7} \Rightarrow \theta = 53°11'$

6) Area $= 2\times\left[\frac{1}{2}ab\sin\hat{C}\right] = 8\times8\sin 110° = 60.1$

7) i) Pythagoras $5^2+12^2 = BD^2 \Rightarrow BD = 13$

∴ Kate walks $13+8 = 21$ metres

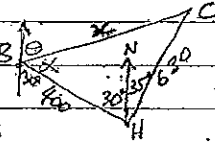
ii) using Cosine Rule:

$BF^2 = 8^2+13^2-2\times8\times13\times\cos 120°$

$BF = 18.36$ m $\Rightarrow$ 2.64 metres further

iii) $\frac{\sin B}{8} = \frac{\sin 120°}{18.36} \Rightarrow \theta = 22°10'$

8) i) →



ii) Use cosine Rule:

$x^2 = 400^2+630^2-2\times400\times630\times\cos 65°$

$x = 586.43 \approx 586$ metres

iii) Find θ (see diagram).

First find α (∠CBH)

$\frac{\sin\alpha}{630} = \frac{\sin 65}{586.43} \Rightarrow \alpha = 76°49' \approx 77°$

∴ bearing is $150-77 = 073°$

OUTCOME 2 — Section 1 —

1) C 2) A 3) C

— Section 2 —

4) i) $\frac{1}{4}$ ii) $\frac{13+3}{52} = \frac{4}{13}$

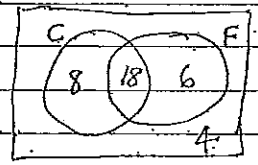
5) i) 356, 365, 536, 563, 635, 653

ii) $\frac{2}{6} = \frac{1}{3}$

6) i) $\frac{4}{36} = \frac{1}{9}$ ii) $\frac{30}{36} = \frac{5}{6}$

— Section 3 —

7) $P = \frac{4}{36} = \frac{1}{9}$

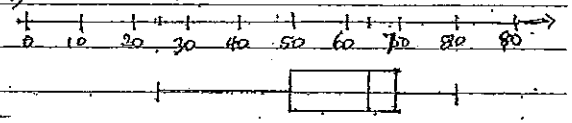


OUTCOME 3 — Section 1 —

1) B 2) C 3) C

— Section 2 —

4)



5) $\bar{x} \approx 55.6$

6) I.Q.R. $= 11-3\frac{1}{2} = 7.5$

— Section 3 —

7) i) Maths was $\frac{20}{9} \approx 2.2$ σ below $\bar{x}$

English was $\frac{10}{13} \approx 0.8$ σ below $\bar{x}$

No English was not as BAD as maths

ii) Both would become smaller.

OUTCOME 4 — Section 1 —

1) B 2) C 3) C

— Section 2 —

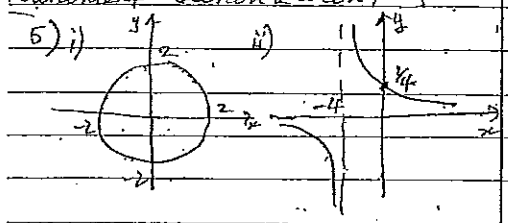
4) i) (0,10) ii) (3,0) & (4,0)

iii) $x = 3.5$ iv) $V = (3.5, -2.25)$

v) $y_{min} = -2\frac{1}{4}$ vi) Clock.

Outcome 4 — Section 2 — con't

5) i)



6) i) Moves DOWN 1.

ii) Moves RIGHT 1.

— Section 3 —

7) $y = k(x+5)(x-1)$ ← sub (0,−2)

$-2 = k(5)(-1) \rightarrow k = \frac{2}{5}$

∴ Equ: $y = \frac{2}{5}(x+5)(x-1)$

8) $x^2+y^2 = 28$ $C = (0,0)$ $R = 4\sqrt{7}$

OUTCOME 5 — Section 1 —

1) A 2) B 3) D

— Section 2 —

4) $P(1) = 6 \Rightarrow k = 1$

5) $\Rightarrow x^2-16 = 0 \Rightarrow x = \pm 4$.

6)
$$x^2+4x+3 \overline{)\,2x^4+0x^3+17x^2+0x-3}\;\;2x^2-8x+9$$

Remainder $60x-30$

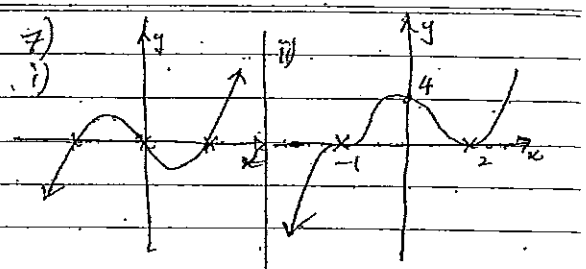
$\therefore P(x) = (x^2+4x+3)(2x^2-8x+9)+12x-30$

8) i) 8.5546 ii) $x = \frac{1}{2}$

9) $\log(x^2-2x) = \log 8$

$x^2-2x-8 = 0$ $x = 4$ or -2.

7)



8) $P(1) = 0 \Rightarrow (x-1)$ is a factor

$$x-1 \overline{)\,x^3+2x^2-13x+10}\;\;x^2+3x-10$$

$\therefore P(x) = (x-1)(x+5)(x-2)$

9) $y = k(x+3)(x-2)^2$ ← sub (0,24)

$24 = k(3)(2)^2 \rightarrow k = 2$

$\therefore P(x) = 2(x+3)(x-2)^2$

10) $P(x) = x^3+ax^2+bx-18$

$P(-2) = -8+4a-2b-18 = 0$ (*)

$P(1) = 1+a+b-18 = -24$ (**)

$\Rightarrow \begin{matrix} 4a-2b = 26 \\ a+b = -7 \end{matrix}\Big\} \begin{matrix} 4a-2b = 26 \\ 2a+2b = -14 \end{matrix}$

$\Rightarrow a = 2 \quad b = -9$.

OUTCOME 6 — Section 1 —

1) A and D 2) A 3) A

— Section 2 —

4) i) −3 ii) −3

5) $3^{3x} = 3^{-2} \rightarrow x = -\frac{2}{3}$

6) i) $\log_2 16 = 4$ ii) $\log_8(8^5\times\sqrt{4}) = 2$

7) i) 0.7781 ii) 0.1761 iii) 1.3801