St Peter the Apostle High

Mathematics Dept.

Higher Prelim Revision 7

Paper I - Non~calculator

Time allowed - 1 hour 30 minutes

Section A - Questions 1 - 20 (40 marks)

Instructions for the completion of **Section A** are given on the next page.

For this section of the examination you should use an **HB pencil**.

Section B (30 marks)

1. Full credit will be given only where the solution contains appropriate working.
2. Answers obtained by readings from scale drawings will not receive any credit.

FORMULAE LIST

Circle:

The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

The equation $(x-a)^2 + (y-b)^2 = r^2$ represents a circle centre (a, b) and radius r.

Trigonometric formulae:

$$\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$$
$$\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$$
$$\sin 2A = 2\sin A\cos A$$
$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1$$
$$= 1 - 2\sin^2 A$$

Read carefully

1 Check that the answer sheet provided is for **Mathematics Higher Prelim 2007/2008 (Section A)**.
2 For this section of the examination you must use an **HB pencil** and, where necessary, an eraser.
3 Make sure you write your **name**, **class** and **teacher** on the answer sheet provided.
4 The answer to each question is **either** A, B, C or D. Decide what your answer is, then, using your pencil, put a horizontal line in the space below your chosen letter (see the sample question below).
5 There is **only one correct** answer to each question.
6 Rough working should **not** be done on your answer sheet.
7 Make sure at the end of the exam that you hand in your answer sheet for Section A with the rest of your written answers.

Sample Question

A line has equation $y = 4x - 1$.

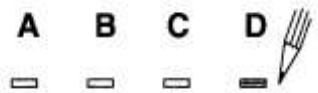
If the point $(k,7)$ lies on this line, the value of k is

A 2
B 27
C 1·5
D -2

The correct answer is **A** $\rightarrow$ 2. The answer **A** should then be clearly marked in pencil with a horizontal line (see below).

Changing an answer

If you decide to change an answer, carefully erase your first answer and using your pencil, fill in the answer you want. The answer below has been changed to **D**.



SECTION A

ALL questions should be attempted except those marked as Unit 3

1. A sequence is defined by the recurrence relation $u_{n+1} = -0.7u_n + 21$ with $u_0 = 10$.
   What is the limit of this sequence?

   A $\frac{210}{17}$
   B $\frac{210}{13}$
   C 30
   D 70

2. A line L is parallel to the line with equation $4x + 2y = 6$ and passes through the point $(-3, 1)$.
   What is the equation of L ?

   A $y - 1 = -2(x - 3)$
   B $y - 1 = 4(x - 3)$
   C $y - 1 = -2(x + 3)$
   D $y + 3 = -2(x - 1)$

3. f and g are functions defined by $f(x) = x^2 + 1$ and $g(x) = 2x$, where x is a real number.
   Find an expression for $f(g(x))$

   A $f(g(x)) = 2x^2 + 2$
   B $f(g(x)) = 4x^2 + 1$
   C $f(g(x)) = 2x^3 + 1$
   D $f(g(x)) = 2x^3 + 2x$

4. How many stationary points does the function $f(x) = 2x^3 - 9x^2 + 12x$ have?

   A 0
   B 1
   C 2
   D 3

5. Find the equation of the line passing through the points with coordinates $(1,-2)$ and $(-3,4)$.

A $3x+2y+1=0$
B $3x-2y-7=0$
C $2x+3y+4=0$
D $2x-3y-8=0$

6. A sequence is defined by the recurrence relation $u_{n+1}=3u_n-7$ and $u_0=1$.
What is the value of u_2?

A -19
B -11
C -4
D -1

7. Express $\dfrac{11}{10-2\sqrt{3}}$ as a fraction with a rational denominator in its simplest form.

A $\dfrac{5+\sqrt{3}}{8}$
B $\dfrac{\sqrt{3}}{4}$
C $\dfrac{5-\sqrt{3}}{4}$
D $\dfrac{5+\sqrt{3}}{4}$

8. A curve has equation $y=x^3+2x^2+5$.
What is the gradient of the curve at the point where $x=1$?

A 7
B 8
C 10
D 12

9. If $\frac{dy}{dx} = 2x + 1$ and $y = 3$ when $x = 1$, express y in terms of x.

A $y = x^2$

B $y = x^2 + x + 1$

C $y = 2$

D $y = x^2 + 2$

12. Find the solution of $x^2 + x - 12 < 0$.

A $x < -4$ *or* $x > 3$

B $x < -3$ *or* $x > 4$

C $-4 < x < 3$

D $-3 < x < 4$

13. Between what values does y lie where $y = \sin 240° + 3\cos x°$ and $0 \le x \le 360$?

A $-5/2 \le y \le 7/2$

B $-7/2 \le y \le 5/2$

C $\dfrac{-\sqrt{3}-6}{2} \le y \le \dfrac{-\sqrt{3}+6}{2}$

D $\dfrac{\sqrt{3}-6}{2} \le y \le \dfrac{\sqrt{3}+6}{2}$

15. If $x+5$ is a factor of the polynomial $x^3 + 4x^2 + kx - 10$ what is the value of k?

A -3

B -7

C -35

D -43