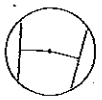
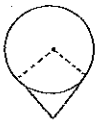
Y10 OPTIONS EXAM 1999 – SBHS

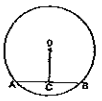
SECTION A GEOMETRY (COMPULSORY)

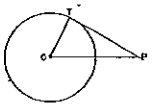
1. What geometrical facts are suggested by the following diagrams?

a) 
b) 
c) 

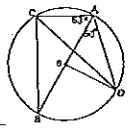
(a)	(b)	(c)

2. If O is the centre, find the radius in each case. Give reasons for your answer.

(a) 
C is the mid-point of AB
$AB = 24$ cm, $OC = 9$ cm

(b) 
PT is a tangent
$PT = 24$ cm, $OP = 25$ cm

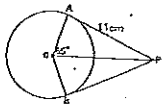
(a)	(b)

3. 

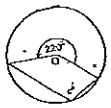
Given the angle sizes indicated in the diagram and that O is the centre find:
(a) $\angle CBA$ (d) $\angle BCD$
(b) $\angle CDA$ (e) $\angle BOD$
(c) $\angle ACD$
Give reasons for your answers.

(a) $\angle CBA =$ _____
(b) $\angle CDA =$ _____
(c) $\angle ACD =$ _____
(d) $\angle BCD =$ _____
(e) $\angle BOD =$ _____

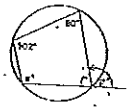
4. If O is the centre of the circle, PA and PB are tangents, $AP = 11$cm and $\angle AOP = 65^\circ$, find:
(a) the length of PB
(b) the measure of $\angle OPB$



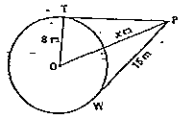
5. (a) Find c. Give a reason.



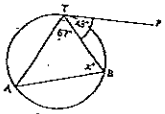
(b) Find the value of each pronumeral
Give a reason



6. PT and PW are tangents and O is the centre of a circle



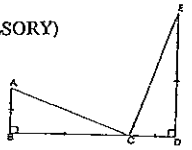
Find x. Give reasons for your answer.

7. 

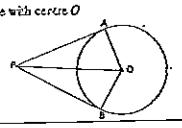
Find x
Give reasons for your answer

SECTION B GEOMETRY (COMPULSORY)

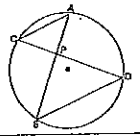
1. Why is $\Delta ABC \equiv CDE$?



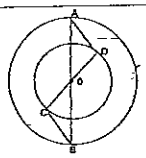
PA and PB are tangents to the circle with centre O
Show that
$\Delta PAO \equiv \Delta PBO$

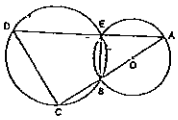


3. AB and CD are chords of a circle intersecting at P.
(a) Show that ΔAPC is similar to ΔDPB
(b) Hence show that $\frac{AP}{PD} = \frac{CP}{PB}$
(c) Now find a product equal to $AP \times PB$



4. If O is the centre of both circles, show that $\angle DAO = \angle CBO$

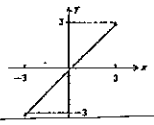
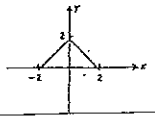
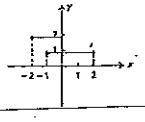


5. 

EB is the common chord of the intersecting circles. AB is a diameter of the smaller circle which is produced to meet the larger circle at C. DA passes through E.
(a) Prove that ΔAEB is similar ΔACD.
(b) Hence or otherwise prove that $\angle ACD = 90^\circ$

SECTION C FUNCTIONS (COMPULSORY)

1. Which of these are functions?

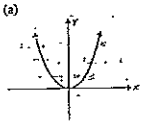
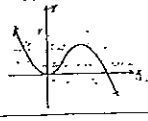
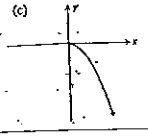
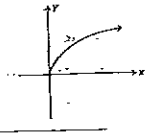
(a) 
(b) 
(c) 

2. A function is determined by $g(x) = \frac{x^2+1}{x}$. Calculate $g(a+1)$

3. If $G(x) = ax^2 + b$, find a and b if $G(1)=1$ and $G(2)=10$.

4. Sketch the function $f(x)=x^2$ for the domain $-2 \le x \le 2$. For what values of x will $f(x) = 2$?
Does this function have an inverse?

5. Which of the following functions would have inverses?

(a) 
(b) 
(c) 
(d) 

6. Find the inverse of the following function $y = \frac{1}{x-1}$

SECTION D LOGARITHMS (COMPULSORY)

1. Simplify:

(a) $x^5 \times x^3 \div x^{11}$ (b) $\dfrac{(5x^2y)^2}{10xy^3}$ (c) $9^x \times 3^x$

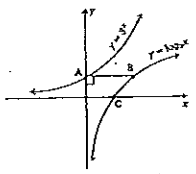
2. Solve: (a) $4^x = 8$ (b) $3^{3-x} = \dfrac{1}{27}$

3. If $\log_a 5 = 0{\cdot}56$, find:

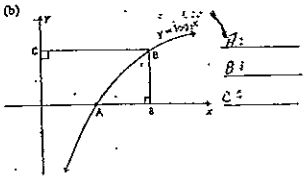
(a) $\log_a 25$ (b) $\log_a \sqrt{5}$

4. For each graph give the coordinates of A, B and C.

(a)



(b)



5. Solve: (Correct to 2 decimal places)

$5^x = 17$

6. Simplify

(a) $\log(x^2 - x - 2) - \log(x+1)$ (b) $\log\sqrt{x^2 - 4x + 4} - \log(x-2)$

7. (i) Find the value of m if: $\log_e 4m - \log_e 3 = \log_e (m+4)$

(ii) Find the value of x if: $\log_e x + \log_e (x-2) = \log_e 3$

8. Find a relationship between x and y, not involving logarithms.

(a) $\log x - \log y = \log(x+y)$

(b) $\log\left(\dfrac{x^2}{y}\right) = \log 2$

(c) $5\log x + 3\log y = \log 2$

ATTEMPT EITHER SECTION E OR SECTION F

SECTION E POLYNOMIALS

1. $P(x) = x^3 - 8x + 6$

$Q(x) = 7x^3 + 2x^2 - x - 5$

What is the degree of $P(x) + Q(x)$; _____

2. A class was discussing the possible values of m in this polynomial of degree 4:

$$mx^4 - 5x^3 + \frac{2}{3}x^2 + x - 9$$

CHRIS said "m must be 1" KERRY "m must be positive".
KIM said "m must be an integer". PAT said "m must be non-zero".
Who was correct?

3. Find the remainder when $3x^4 - 7x^3 + 2x^2 - x + 5$ is divided by $(x-1)$

4. If $x^3 - 5x^2 + 7x - 2 = (x-2)(ax^2 + bx + c)$ *find* a, b, c.

5. Show that $(x-3)$ and $(x+4)$ are both factors of

$x^3 + 2x^2 - 11x - 12$.

6. $ax^4 + bx^2 - 2$ is divisible by $x+1$.

When $ax^4 + bx^2 - 2$ is divided by $x-2$, the remainder is 42.
Write down two equations which could be used to find a and b. NOTE: Do not solve for a and b.

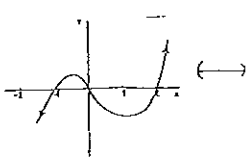
7. Find the roots of $x^3 - x^2 - 10x - 8 = 0$.

SECTION F: CURVE SKETCHING

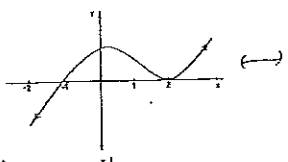
1. Consider the zeros of each of the given polynomial functions and match each graph with its equation.

(a) $y = (x+2)(x^2 - x + 3)$ (c) $y = (x+1)(x-2)^2$
(b) $y = (x+1)(x+2)(2-x)$ (d) $y = x(x+1)(x-2)$

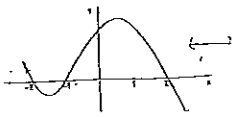
(i)



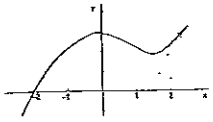
(ii)



(iii)

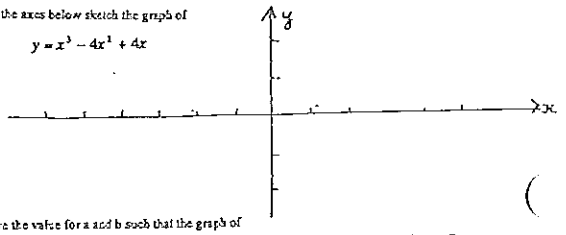


(iv)



2. On the axes below sketch the graph of

$y = x^3 - 4x^2 + 4x$



3. Give the value for a and b such that the graph of

$f(x) = (ax - 3)(x - b)^2$ cuts the x axes at 1.5 and touches the x axis at $x=7$.

4. On the same number plane below sketch

(i) $y = x^5$ and (ii) $y = (x-2)^5$

5. Find the centre and radius of the circle

$x^2 + 6x + y^2 + 8y = 0$. Sketch the graph

6. Show that $3x + 4y - 5 = 0$ is a tangent to the circle $x^2 + y^2 = 1$.