St Peter the Apostle High

Mathematics Dept.

Higher Prelim Revision 1

Paper I - Non~calculator

Time allowed - 1 hour 10 minutes

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:	$\sin \mathbf{A} \pm B = \sin A \cos B \pm \cos A \sin B$
	$\cos \mathbf{A} \pm B = \cos A \cos B \mp \sin A \sin B$
	$\sin 2A = 2\sin A \cos A$
	$\cos 2A = \cos^2 A - \sin^2 A$
	$= 2\cos^2 A - 1$
	$= 1 - 2\sin^2 A$

All questions should be attempted

Two functions, defined on suitable domains, are $f(x) = x(x^2 - 1)$ & g(x) = x - 1. 1.

- Show that the composite function, h(x) = f (x), can be written in the form (a) $h(x) = ax^3 + bx^2 + cx$, where a, b and c are constants, and state the value(s) of *a*, *b* and *c*.
- Hence solve the equation h(x) = 6, for x, showing clearly that there is (b) only one solution.



- Hence calculate the **exact** shortest distance between the lines L_1 and L_2 . (c)
- For what value of p, where p > 0, does the equation $(p^2 + 11)x^2 12px + p^2 = 0$ 3. have equal roots?

The diagram shows part of the graph of y = f(x). 5.



4

4

2

6

Sketch the graph of $y = - \int f(x+3)$ marking clearly the **new** positions of the highlighted points and stating their new coordinates. 3

- 6. A function, f, is defined on a suitable domain as $f(x) = \frac{1}{x} \Phi^2 \sqrt{x}$.
 - (a) Differentiate f with respect to x, expressing your answer with positive indices. 4

3

2

2

4

(b) Hence find x when f'(x) = 5.

- 8. A sequence is defined by the recurrence relation $U_{n+1} = aU_n + 20$, where *a* is a constant.
 - (a) Given that $U_0 = 10$ and $U_1 = 26$, find a.
 - (b) Find the value of S_2 , if $S_2 = U_1 + U_2$.
- 9. A curve has as its derivative $\frac{dy}{dx} = 3x^2 4x$.

Given that the point (3, -7) lies on this curve, express y in terms of x.