LOCI, LINEAR INEQUALITIES

CALCULUS: CURVE SKETCHING, AREA APPROXIMATIONS

1. The equation of the curve is $y = \frac{1}{3}x^3 - 2x^2 + 3x + 5$.

a) (i) Determine the stationary points of the curve. (3 marks)

(ii) For each point in a (i) above determine the nature of the points hence sketch the curve.
(4 marks)

b) Find the equation of the tangent to the curve at x = 2. (3 marks)

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2. a) i) Find the coordinates of the stationary points on the curve $y=x^3-3x+2$. (3 marks)

ii) For each stationary point determine whether it is a minimum or a maximum.

(4 marks)

b) In the space provided, sketch the graph of the function $y=x^3-3x+2$.(3 marks)

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3. The equation of a curve is $y = -2x^2 + x + 1$

a) Find

(i) The gradient of the curve at P(5, -44) (3mks)

(ii) The y intercept (1mk)

(b) (i) Determine the stationary point of the curve (3mks)

(ii) Sketch the curve (3mks)

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4. Using a ruler and pair of compas only construct :

(a) An equilateral triangle ABC of side 6cm

(b) The focus of a point P inside the triangle such that AP $\leq$ PB

(c) The locus of a point Q such that AQ > 4cm

(d) Mark and label the region x inside the triangle which satisfy the two loci. (4mks)

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5. Above line AB = 10cm drawn below, construct and label in a single diagram, using a pair of a compasses and ruler only;

a) The locus of a point X such that the area of a triangle ABX is $15cm^2$.

b) The locus of a point Y such that angle AYB = 90^o.

c) Locate points P and Q where loci X and Y intersect. Measure PQ.

d) Show by shading and labeling the region R which satisfies the conditions below simultaneously:

i) Angle ARB $\geq 90^o$

ii) Area of triangle ABR $\geq 15cm^2$

e) Calculate the area of the shaded region R in (d) above. (Take π = 3.142) (10 marks)

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6. (a) Construct rectangle **ABCD** with side **AB** = 6.4cm and diagonal **AC** = 8cm. (3mks)

(b)Locus, $\mathbf{L_1}$, is a set of points equidistant from **A** and **B** and locus, $\mathbf{L_2}$, is a set of points equidistant from **BC** and **BA**. If $\mathbf{L_1}$ and $\mathbf{L_2}$ meets at **N** inside the rectangle, locate point **N**. (3mks)

(c)A point ***x*** is to be located inside the rectangle such that it is nearer **B** than **A** and also nearer

AB than **BC**. If its not greater than 3cm from **N** shade the region where the points could be located.

(4mks)

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7. Using a ruler and a pair of compasses only construct

i. Triangle ABC, such that AB = 9cm, AC = 7cm and < CAB = 60° (2mks)

ii. The locus of P , such that $AP \leq BP$ (2mks)

iii. The locus of Q such that $CQ \leq 3.5cm$

iv. Locus of R such that angle ACR ≤ angle BCR
(2mks)

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8. The line segment BC = 7.5 cm long is one side of triangle ABC.

a) Use a ruler and compasses only to complete the construction of triangle ABC in which
$\angle ABC = 45^{o}$, AC = 5.6 cm and angle BAC is obtuse.
{3 marks}

b) Draw the locus of a point P such that P is equidistant from a point O and passes through the vertices of triangle ABC.
{3 marks}

c) Locate point D on the locus of P equidistant from lines BC and BO. Q lies in the region enclosed by lines BD, BO extended and the locus of P. Shade the locus of Q. {4 marks}

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9.