
AS MATHEMATICS – ALGEBRA TEST

NAME _____

Question 1

Find, using algebra, all real solutions to the equation

(i) $16a^2 = 2\sqrt{a}$ (4)

(ii) $b^4 + 7b^2 - 18 = 0$ (4)

Question 2

The line l has equation $y = -2x + 5$

- (a) Show that the x coordinate of any point of intersection of l with C is given by a solution of the equation

$$2x^2 - 4x + k^2 = 0$$

(2)

- (b) Hence find the exact values of k for which l is a tangent to C .

(3)

Question 3

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(i) Solve the equation

$$x\sqrt{2} - \sqrt{18} = x$$

writing the answer as a surd in simplest form.

(3)

(ii) Solve the equation

$$4^{3x-2} = \frac{1}{2\sqrt{2}}$$

(3)

Question 4

In this question you should show all stages of your working.

Solutions relying on calculator technology are not acceptable.

Using algebra, solve the inequality

$$x^2 - x > 20$$

writing your answer in set notation.

(3)

Question 5

In this question you should show all stages of your working.

Solutions relying on calculator technology are not acceptable.

Given

$$\frac{9^{x-1}}{3^{y+2}} = 81$$

express y in terms of x , writing your answer in simplest form.

(3)

Question 6

Using algebra, find all solutions of the equation

$$3x^3 - 17x^2 - 6x = 0$$

(3)

Question 7

Using the substitution $u = \sqrt{x}$ or otherwise, solve

$$6x + 7\sqrt{x} - 20 = 0$$

(4)

Question 8

An equation

$$x^2 - 3px + 5q + 4 = 0$$

where p and q are constants, has equal roots.

Show that

$$q = \frac{1}{20}(3p + 4)(3p - 4)$$

(3)

Question 9

**In this question you must show all stages of your working.
Solutions relying on calculator technology are not acceptable.**

Find the values of x for which

(a) $4(x - 3) > 8 - 2x$

(2)

(b) $(2x + 5)(x - 8) < 0$

(2)

(c) both $4(x - 3) > 8 - 2x$ and $(2x + 5)(x - 8) < 0$

(1)

Question 10

The straight line l has equation $y = 2x + k$, where k is a constant.

Given that l cuts C at least once,

(i) show that

$$k^2 + 16k + 56 \geq 0 \quad (4)$$

(ii) find the range of values of k , giving your answer in set notation.

(2)

Question 11

$$f(x) = x^3 + x^2 + px + q, \text{ where } p \text{ and } q \text{ are constants.}$$

Given that $f(5) = 0$ and $f(-3) = 8$,

find the values of p and q ,

(4)