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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	FACTOR THEOREM
PAPER TYPE:	QUESTION PAPER -1
TOTAL QUESTIONS	8
TOTAL MARKS	44

Questions

Q1.

$$f(x) = 4x^3 - 12x^2 + 2x - 6$$

(a) Use the factor theorem to show that (x – 3) is a factor of f(x).

(2)

(b) Hence show that 3 is the only real root of the equation f(x) = 0

(4)

(Total for question = 6 marks)

Q2.

$$g(x) = 4x^3 - 12x^2 - 15x + 50$$

(a) Use the factor theorem to show that (x + 2) is a factor of g(x).

(2)

(b) Hence show that g(x) can be written in the form
g(x) = (x + 2)(ax + b)^2, where a and b are integers to be found.

(4)

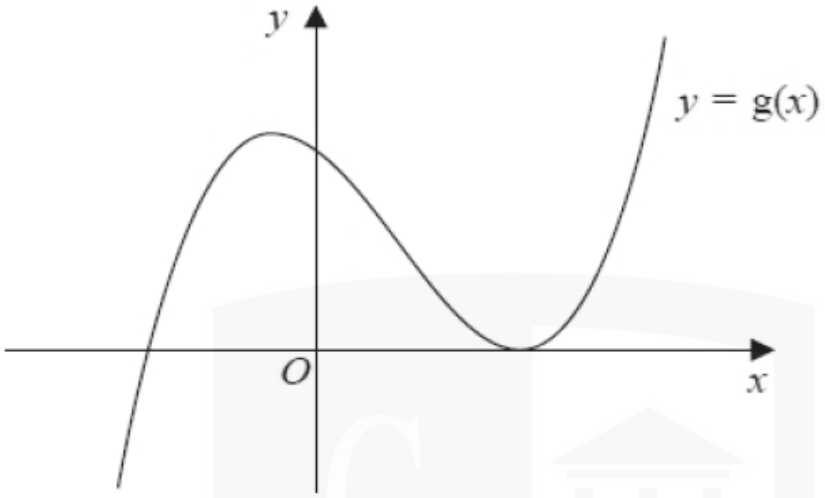

Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = g(x)$.

(c) Use your answer to part (b), and the sketch, to deduce the values of x for which

(i) $g(x) \leq 0$

(ii) $g(2x) = 0$

(3)

(Total for question = 9 marks)

Q3.

$$f(x) = 2x^3 - 13x^2 + 8x + 48$$

(a) Prove that $(x - 4)$ is a factor of $f(x)$.

(2)

(b) Hence, using algebra, show that the equation $f(x) = 0$ has only two distinct roots.

(4)

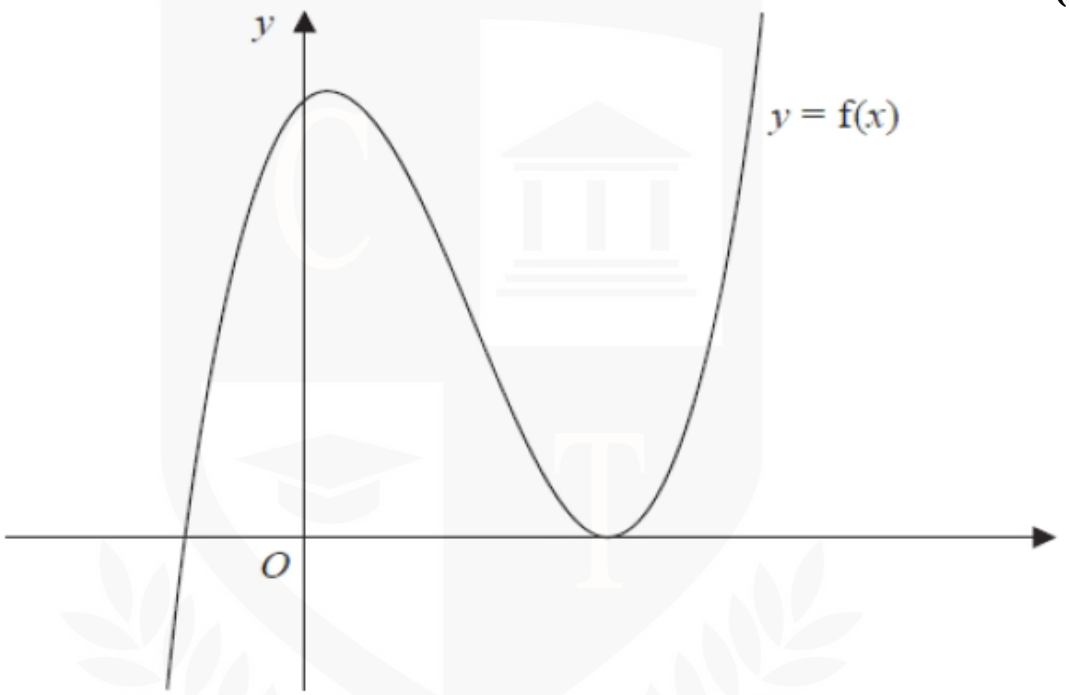

Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = f(x)$.

(c) Deduce, giving reasons for your answer, the number of real roots of the equation

$$2x^3 - 13x^2 + 8x + 48 = 0$$

(2)

Given that k is a constant and the curve with equation $y = f(x + k)$ passes through the origin,

(d) find the two possible values of k.

(2)

(Total for question = 10 marks)

Q4.

$$g(x) = 2x^3 + 4x^2 - 41x - 70$$

(a) Use the factor theorem to show that g(x) is divisible by ($x - 5$).

(2)

(b) Hence, showing all your working, write g(x) as a product of three linear factors.

(4)

The finite region R is bounded by the curve with equation y = g(x) and the x-axis, and lies below the x-axis.

(c) Find, using algebraic integration, the exact value of the area of R.

(4)

(Total for question = 10 marks)

Q5.

$$f(x) = 2x^3 - 5x^2 + ax + a$$

Given that $(x + 2)$ is a factor of f (x), find the value of the constant a.

(3)

(Total for question = 3 marks)

Q6.

$$f(x) = -3x^3 + 8x^2 - 9x + 10, \quad x \in \mathbb{R}$$

(a) (i) Calculate f (2)

(ii) Write f (x) as a product of two algebraic factors.

(3)

Write f (x) as a product of two algebraic factors.

(b) prove that there are exactly two real solutions to the equation

$$-3y^6 + 8y^4 - 9y^2 + 10 = 0$$

(2)

(c) deduce the number of real solutions, for $7\pi \leq \theta < 10\pi$, to the equation

$$3tan^3\theta - 8tan^2\theta + 9\tan\theta - 10 = 0$$

(1)

(Total for question = 6 marks)

Q7.

$$f(x) = 3x^3 + 2ax^2 - 4x + 5a$$

Given that $(x + 3)$ is a factor of $f(x)$, find the value of the constant a.

(3)

(Total for question = 3 marks)

Q8.

$$f(x) = ax^3 + 10x^2 - 3ax - 4$$

Given that $(x - 1)$ is a factor of $f(x)$, find the value of the constant a.

You must make your method clear.

(3)

(Total for question = 3 marks)

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