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WORKSHEET

SEC 3 ADDITIONAL MATHEMATICS

1.1 LINEAR AND NON-LINEAR SIMULTANEOUS EQUATIONS

1.1 WORKED EXAMPLE 1

Solve the simultaneous equations,

$$xy - 3x - 11 = 0$$

$$3y = x + 1$$

Hence, state the coordinates of the points of intersections between the curve, $xy - 3x - 11 = 0$ and the line, $3y = x + 1$.

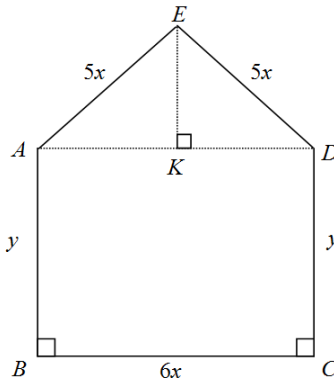
1.1 WORKED EXAMPLE 2

A solid rectangular block has a square base of side x cm and height of y cm. The total surface area of the rectangular block is 90 cm^2 and the total length of the 12 edges is 48 cm. Show that $x^2 - 8x + 15 = 0$ and find the possible values of x and of y .

1.1 PRACTICE NOW 1

QUESTION 1

A garden is of the shape $ABCDE$ as shown in the diagram below. AB and DC are perpendicular to BC . It is given that $AE = DE = 5x$ m, $AB = DC = y$ m and $BC = 6x$ m.



- (a) Find an expression, in terms of x , for the length of EK .
- (b) The perimeter and area of the garden are 54 m and 180 m^2 respectively. Write down a pair of simultaneous equations relating x and y .
- (c) Solve the pair of simultaneous equations to find the values of x and y .

QUESTION 2

Find the coordinates of the points of intersection of the line $2x + y = 3$ and the curve $3x^2 - y^2 + 4xy - 6 = 0$.

QUESTION 3

Find the coordinates of the points of intersection of the graphs with equations $3 = x - 2y$ and $xy = 20 - 3y$.

QUESTION 4

Solve the simultaneous equations.

$$2x - 5y + 17 = 0$$

$$xy = 6$$

QUESTION 5

A positive whole number has two digits which can be expressed as $10x + y$ where $x > y$. When the two digits are reversed, a new number is formed. The difference between the squares of the two numbers is 1584. The sum of the two numbers is 44 times the difference between the digits of the original number. Find the two numbers.

1.2 POLYNOMIALS AND LONG DIVISION

1.2 CONCEPTUAL BRIDGING - POLYNOMIALS AND ITS DEGREES

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Expressions	Polynomial/ Non-polynomials	Degree	
$P(x) = 4x^4 - 5x^3 - 2x + 1$			$P(-1) =$
$Q(x) = x^6 - x^3 + x + 2$			$Q(2) =$
$f(x) = 3x^2 + \sqrt{x} - 3x + 1$			$f(4) =$
$g(x) = 10$			$g(-1) =$
$k(x) = 3x^{-2} - x^{-4} + 5x^2 - 2$			$k(-2) =$

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1.2 WORKED EXAMPLE 1 (ADDITION AND SUBTRACTION OF POLYNOMIALS)

If $P(x) = x^4 + 3x^2 - 2x + 5$, and $Q(x) = x + 2$, find an expression for

(a) $P(x) + Q(x)$, and

(b) $P(x) - Q(x)$.

State the degree of each expression

1.2 WORKED EXAMPLE 2 (MULTIPLICATION OF POLYNOMIALS)

If $P(x) = 3x^3 + 11x^2 - 4x + 5$ and $Q(x) = x + 7$, find

(i) $P(x) \times Q(x)$,

(ii) $P(2) \times Q(2)$,

(iii) the relationship between the degrees of $P(x)$, $Q(x)$ and $P(x) \times Q(x)$

1.2 WORKED EXAMPLE 3 (FINDING UNKNOWN COEFFICIENTS)

If $2x^3 - x^2 - 5x - 4 = (Ax + 3)(x - 3)(x + 1) + Bx + C$ for all real values of x , find A , B and C .

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1.2 WORKED EXAMPLE 4 (EQUATING COEFFICIENTS)

Find the values of the unknown constants a , b and c in $2x^3 - 3x^2 - 5x + 18 \equiv (x + 2)(ax^2 + bx + c)$.

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1.2 PRACTICE NOW 1

QUESTION 1

A polynomial $h(x) = 2x^3 + Ax^2 + Bx - 6$. It is given that $2x^3 + Ax^2 + Bx - 6 \equiv (x+3)(2x^2 - 3x - 2)$. Find the value of A and of B .

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QUESTION 2

Given that $3x^3 + 4x^2 - 5x + 2 = (Ax+1)(x+2)(x+B) + C$ for all values of x , find the value of A , B and C .

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QUESTION 3

Given that $3x^3 + x^2 - 2x - 3 = (Ax + B)(x - 1)(x + 2) + C(x - 1) + D$ for all values of x , find the values of A , B , C and D .

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QUESTION 4

Given the identity $Ax^3 + x^2 - 2x - 3 \equiv (3x + B)(x - 1)(x + 2) + C(x - 1) + D$, find the values of the constants A , B , C and D .

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QUESTION 5

Given that $2x^3 + x^2 - 3x - 4 \equiv (2x + A)(x + 1)(x - 3) + B(x + 1) + C$ for all values of x . Find the values of A , B and C .

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QUESTION 6

Find the values of A , B and C given that $2x^3 + 5x^2 - 18x + 14 \equiv (Ax - 1)(x - 2)(x + 5) + B(x + 1) + C$.

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1.2 WORKED EXAMPLE 5 (LONG DIVISION OF POLYNOMIALS)

Divide $3x^4 - x^3 + 2x + 1$ by $x - 1$ and state the quotient and remainder.

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1.2 PRACTICE NOW 2**QUESTION 1**

Divide $5x^3 + 6x^2 + x - 5$ by $x + 1$ and state the quotient and remainder.

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QUESTION 2

Divide $2x^3 - x^2 - 7x - 5$ by $2 - x$ and state the quotient and remainder.

QUESTION 3

Find the quotient and remainder when $2x^3 + 7x^2 - 4x + 15$ is divided by $2x + 3$.