CHEMISTRY ONLINE
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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	DIFFERENTIATION
PAPER TYPE:	SOLUTION - 5
TOTAL QUESTIONS	8
TOTAL MARKS	43

1)

1. Differentiate y with respect to x:

$$\frac{dy}{dx} = \frac{(3x^2 6x|2)(x^2 \ \ 4x \ \ |3)(x^3 \ \ 3x^2|2x)(2x \ \ 4)}{(x^2 \ \ 4x\ |3)^2}$$

$$\frac{dy}{dx} = \frac{3x^4 \ \ 12x^3|11x^2|12x \ \ 6}{(x^2 \ \ 4x\ |3)^2}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ find the range where the curve is increasing:

$3x^4 - 12x^3 + 11x^2 + 12x - 6 > 0$

- This polynomial inequality may require further analysis or numerical methods to find the exact range of values for which the curve is increasing.

2)

1. Differentiate y with respect to x:

- Apply the quotient rule:

$$\frac{dy}{dx} = \frac{(2x)(x^2|2x|1)(x^2 \ 4)(2x|2)}{(x^2|2x|1)^2}$$

$$\frac{dy}{dx} = \frac{2x^3|4x^2|2x \ \ 2x^3|8x|8}{(x^2|2x|1)^2}$$

$$\frac{dy}{dx} = \frac{4x^2|10x|8}{(x^2|2x|1)^2}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:

$4x^2 + 10x + 8 > 0$

- Solve for x to find the range of values for which the curve is increasing.

3)

1. Differentiate y with respect to x:

- Apply the derivative rules for the absolute value function and the polynomial term:

$$\frac{dy}{dx} = \frac{(2x \ \ 4)(x^2 \ \ 4x|3)}{|x^2 4x|3|}$$

2. Determine where the curve is increasing:

- Since the absolute value function can change sign, we need to consider where $x^2 – 4x + 3$ is positive or negative.
- Factor the quadratic expression: x2 – 4x + 3 = (x – 1) (x – 3)
- Analyze the intervals $(-\infty, 1), (1,3), and (x - \infty)$ to determine where $\frac{dy}{dx} > 0$.

4)

1. Differentiate y with respect to x:

- Apply the quotient rule:

$$\frac{dy}{dx} = \frac{(12x^2\ \ 12x\ 36)(x^2\ \ 6x\ |8)\ \ (4x^3\ \ 6x^2 36x\ |15)(2x\ \ 6)}{(x^2\ \ 6x\ |8)^2}$$

$$\frac{dy}{dx} = \frac{12x^4\ \ 72x^3|96x^2\ 12x^3|72x^2 96x\ 36x^2|216x\ \ 288\ 8x^4|12x^3|72x^2 18x^2}{(x^2\ \ 6x\ |8)^2}$$

$$\frac{dy}{dx} = \frac{4x^4\ \ 60x^2|150x^2|120x\ \ \ 288}{(x^2\ \ 6x\ |8)^2}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:

$4x^4 – 60x^3 + 150x^2 + 120x – 288 > 0$

- This polynomial inequality may require further analysis or numerical methods to find the exact range of values for which the curve is increasing.

5)

I am Sorry !!!!!

1. Differentiate y with respect to x:

$$\frac{dy}{dx} = \frac{(6x^2\ \ 6x\ |4)(x^2\ 2x|1)\ \ (2x^3\ 3x^2|4x\ \ 5)(2x\ \ 2)}{(x^2\ \ 2x|1)^2}$$

$$\frac{dy}{dx} = \frac{6x^4\ \ 12x^3|4x^2\ \ \ 6x^3|12x^2\ \ 4x|4x^3 6x^2|8x\ \ 10\ \ \ 4x^4|6x^3\ 8x^2|10x}{(x^2\ \ 2x|1)^2}$$

$$\frac{dy}{dx} = \frac{2x^4|4x^3||6x^2|2x\ \ 10}{(x^2\ \ 2x|1)^2}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:

$2x^4 + 4x^3 + 6x^2 + 2x + 10 > 0$

- This polynomial inequality may require further analysis or numerical methods to find the exact range of values for which the curve is increasing.

6)

1. Differentiate y with respect to x:

- Apply the quotient rule:

$$\frac{dy}{dx} = \frac{(3x^2 6x|2)(x^2 \;\; 4x \,|\, 3) \quad (x^3 3x^2|2x)(2x \;\; 4)}{(x^2 \quad 4x\,|3)^2}$$

$$\frac{dy}{dx} = \frac{3x^4 \;\; 12x^3\,|11x^2|12x \;\; 6}{(x^2 \quad 4x\,|3)^2}$$

2. Determine where the curve is increasing?

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:

  $3x^4 – 12x^3 + 11x^2 + 12x – 6 > 0$

- This polynomial inequality may require further analysis or numerical methods to find the exact range of values for which the curve is increasing.

7)

1. Differentiate y with respect to x:

- Apply the derivative rules for the natural logarithm and the polynomial term:

$$\frac{dy}{dx} = \frac{3x^2|2}{x^3|2x}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:

$$\frac{3x^2|2}{x^3|2x} > 0$$

- Solve for x to find the range of values for which the curve is increasing.

8)

1. Differentiate y with respect to x:

- Apply the quotient rule:

$$\frac{dy}{dx} = \frac{(4x^3\ \ 12x^2\ |12x\ \ 4)(x^3\ \ 3x^2\ |3x\ \ 1)\left(x^4\ 4x^3\ |6x^2\ 4x\ |1\right)(3x^2\ 6x\ |3)}{(x^3\ 3x^2\ |3x\ \ \ 1)^2}$$

$$\frac{dy}{dx} = \frac{4x^6\ \ 12x^5\ |12x^4\ 4x^4|12x^3\ 12x^2\ \ \ 12x^4\ |36x^3\ \ 36x^2|12x\ 4x^5\ |12x^4 18x^3|12x^2\ 12x\ |4}{\left(x^3\ 3x^2\ |3x\ \ \ 1\right)^2}$$

$$\frac{dy}{dx} = \frac{4x^6\ \ 16x^5\ |24x^4\ 18x^3\ |12x}{(x^3\ 3x^2\ |3x\ \ \ 1)^2}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:
  $4x^6 - 16x^5 + 24x^4 - 18x^3 + 12x > 0$
- This polynomial inequality may require further analysis or numerical methods to find the exact range of values for which the curve is increasing.

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