CHEMISTRY ONLINE
— TUITION —

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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	DIFFERENTIATION
PAPER TYPE:	SOLUTION - 4
TOTAL QUESTIONS	8
TOTAL MARKS	43

1)

1. Differentiate y with respect to x:

- Apply the chain rule for the absolute value function and the power rule for the polynomial term:

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

2. Determine where the cure 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: $x^2 - 4x + 3 = (x - 1)(x - 3)$
- Analyze the intervals (- ∞, 1), (1,3) and (3,∞) to determine where $\frac{dy}{dx}$ > 0.

2)

1. Differentiate y with respect to x:

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3)

1. Differentiate y with respect to x:

- Apply the quotient rule and the power rule for the square root function:

$$\frac{dy}{dx} = \frac{(\sqrt{x})(2x \quad 2)\left(x^2|2x|1\left(\frac{1}{2\sqrt{x}}\right)\right)}{x}$$

$$\frac{dy}{dx} = \frac{2x\sqrt{x}\,\Big|2\sqrt{x}\ \frac{x^2+2x+1}{2\sqrt{x}}}{x}$$

2. Simplify the derivative:

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

$$\frac{dy}{dx} = \frac{3x^2|2x\ \ 1}{2x\sqrt{x}}$$

3. Determine where the curve is increasing:

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

$$\frac{dy}{dx} = \frac{3x^2|2x\ \ 1}{2x\sqrt{x}} > 0$$

- Solve for x by considering the properties of the rational function and the square root function.

4)

1. Differentiate y with respect to x:

- Apply the chain rule for the logarithmic function and the derivative of the absolute value function:

$$\frac{dy}{dx} = \frac{1}{x^2\ \ 4}\,.2x$$
$$\frac{dy}{dx} = \frac{2x}{x^2\ \ 4}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:
$$\frac{2x}{x^2\ \ 4} > 0$$
- Solve for x by considering the properties of the logarithmic function and the absolute value function.

5)

1. Differentiate y with respect to x:

- Apply the derivative rules for the same function and the natural logarithm:

$$\frac{dy}{dx} = cos\ (x) + \frac{1}{x}$$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:
  Cos(x) + $\frac{1}{x}$ > 0
- Solve for x by considering the properties of the cosine function and the logarithmic function.

6)

1. Differentiate y with respect to x:

- Apply the chain rule for the square root function and the derivative of the absolute value function:

$$\frac{dy}{dx} = \frac{1}{2\sqrt{|x^2\ \ 4|}}.\frac{d}{dx}|x^2 - 4|$$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{|x^2\ \ 4|}}.\frac{d}{dx}|x^2 - 4|$$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{|x^2\ \ 4|}}.2x$$

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

2. Determine where the curve is increasing:

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

$$\frac{1}{\sqrt{|x^2\ \ 4|}} > 0$$

- Solve for x by considering the properties of the square root function and the absolute value function.

7)

1. Differentiate y with respect to x:

- Apply the power rule for the polynomial term and the derivative of the exponential function:

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

2. Determine where the curve is increasing:

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

$3x^2 + e^x > 0$

- Solve for x by considering the properties the polynomial function and the exponential function.

8)

1. Differentiate y with respect to x:

- Apply the derivative rules for the sine function and the power rule for the polynomial term:

  $\frac{dy}{dx} = \cos(x) + 2x$

2. Determine where the curve is increasing:

- Set $\frac{dy}{dx} > 0$ to find the range where the curve is increasing:
  $\text{Cos}(x) + 2x > 0$
- Solve for x by considering the properties of the cosine function and the polynomial function.

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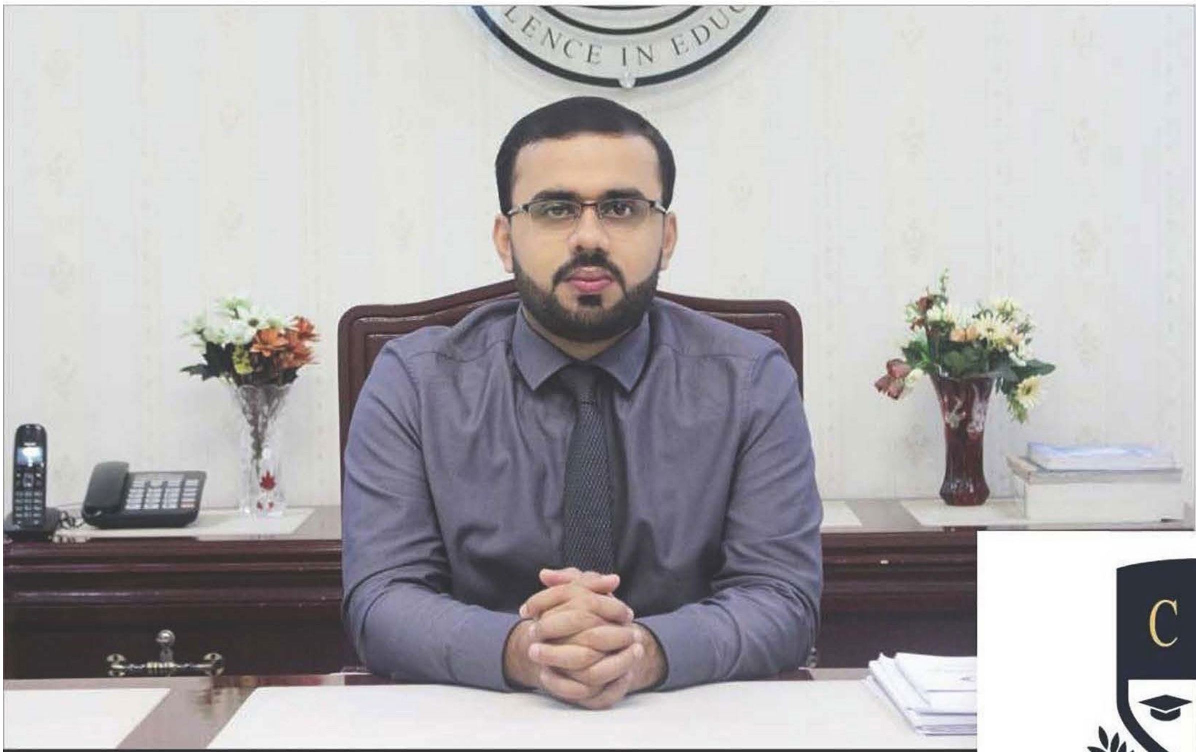

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