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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	DIFFERENTIATION
PAPER TYPE:	SOLUTION - 9
TOTAL QUESTIONS	8
TOTAL MARKS	43

Differentiation - 9

1)

1. Apply the Chain Rule:

- Let u = 3x2 + 2x.
- Differentiate u with respect to x: $\frac{du}{dx}$ = 6x + 2.
- Apply the chain rule: $\frac{dy}{dx} = \frac{dy}{du} . \frac{du}{dx}$.

2. Differentiate y with respect to u:

- $\frac{dy}{du} = \frac{1}{2\sqrt{\cos(u)}}$. (- sin(u).

3. Combine the results:

- $\frac{dy}{dx} = \frac{Sin(3x^2+2x)}{2\sqrt{cos(3x^2+2x)}}$. (6x + 2).

2)

Inner function $y(x) = 2x^3 – 5x^2 + 4$

Outer function $h(x) = g(x)^4$

Now, apply the chain rule step by step:

1. Find h'(x):

   $h'(x) = 4g(x)^3 . g'(x)$

2. Find g'(x):

$g'(x) = 6x^2 – 10x$

3. Substitute g(x) and g'(x) into h'(x):
   $h'(x) = 4(2x^3 – 5x^2 + 4)^3 . (6x^2 – 10x)$

This is the derivative of $f(x) = (2x^3 – 5x^2 + 4)^4$ using the chain rule.

3)

1. Find h'(x), the derivative of the outer function h(x):

h'(x) = $\frac{1}{2\sqrt{x}}$

2. Find g'(x), the derivative of the inner function g(x):

g'(x) = 4x + 3

3. Substitute g(x) and g'(x) into h'(x) using the chain rule:

F'(x) = h'(g(x)) . g'(x) = $\frac{1}{2\sqrt{2x^2+3x-1}}$. (4x + 3)

So, the derivative of f(x) = $\sqrt{2x^2 + 3x - 1}$ using the chain rule is f'(x) = $\frac{4x+3}{2\sqrt{2x^2+3x-1}}$

4)

1. Find h'(x), the derivative of the outer function h(x):

h'(x) = e^x

2. Find g'(x), the derivative of the inner function g(x):

g'(x) = 4x + 3

3. Substitute g(x) and g'(x) into h'(x) using the chain rule:

F'(x) = h'(g(x)) . g'(x) = e^{2x^2+3x}.(4x + 3)

So, the derivative of f(x) = e^{2x^2+3x} using the chain rule is f'(x) = (4x + 3) e^{2x^2+3x}.

5)

Inner function: g(x) = 3x2 + 2x

Outer function: h(x) = ln(x)

Now, let's find the derivatives step by step:

1. Find h'(x), the derivative of the outer function h(x):

h'(x) = $\frac{1}{x}$

2. **Find g'(x), the derivative of the inner function g(x):**
   g'(x) = 6x + 2
3. **Substitute g(x) and g'(x) using the chair rule:**
   F'(x) = h'(g(x)) . g'(x) = $\frac{1}{3x^2+2x}$. (6x + 2)

So, the derivative of f(x) = ln(3x2 + 2x) using the chain rule is f'(x) = $\frac{6x+2}{3x^2+2x}$.

6)

1. **Apply the Chain Rule:**
   - Let u = 2x2 + 3x.
   - Differentiate u with respect to x: $\frac{du}{dx}$ = 4x + 3.
   - Apply the chain rule: $\frac{dy}{dx} = \frac{dy}{du} . \frac{du}{dx}$
2. **Differentiate y with respect to u:**
   - $\frac{dy}{du}$ = cos (u).
3. **Combine the results:**
   - $\frac{dy}{du}$ = cos(2x^2 + 3x) . (4x + 3).

7)

Inner function: g(x) = ln(2x + 1)

Outer function: h(x) = $\sqrt{x}$

Now, let's find the derivatives step by step:

1. **Find h'(x), the derivative of the outer function h(x):**
   h'(x) = $\frac{1}{2\sqrt{x}}$
2. **Find g'(x), the derivative of the inner function g(x):**

   g'(x) = $\frac{2}{2x+1}$
3. **Substitute g(x) and g'(x) into h'(x) using the chain rule:**
   F'(x) = h'(g(x)) . g'(x) = $\frac{1}{2\sqrt{\ln(2x+1}}$. $\frac{2}{2x+1}$

Simplifying we get:

f'(x) = $\frac{1}{(2x+1)\sqrt{\ln(2x+1)}}$

So, the derivative of f(x) = $\sqrt{\ln(2x+1)}$ using the chain rule is f'(x) = $\frac{1}{(2x+1)\sqrt{\ln(2x+1)}}$.

8)

To differentiate f(x) using the chain rule, we first identify the inner

Function and the outer function:

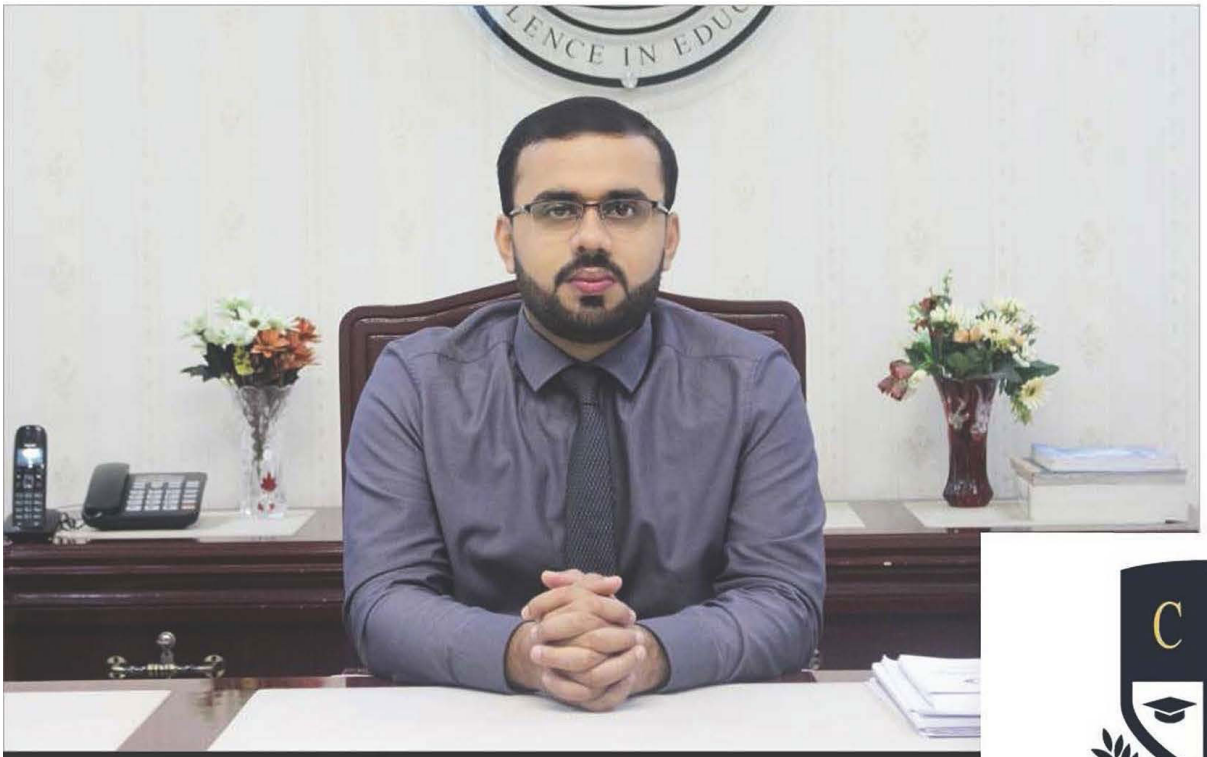
Inner function $g(x) = 3x^2 + 2x + 1$

Outer function: h(x) – cos(x)

Now, let's and the derivatives step by step:

1. **Find h'(x), the derivative of the outer function h(x):**
   $h'(x) = - \sin(x)$
2. **Find g'(x), the derivative of the inner function g(x)**
   $g'(x) = 6x + 2$
3. **Substitute g(x) and g'(x) into h'(x) using the chain rule:**
   $f'(x) = h'(g(x)) \cdot g'(x) = - \sin(3x^2 + 2x + 1) \cdot (6x + 2)$

   So, the derivative of $f(x) = - (6x + 2) \sin (3x^2 + 2x + 1)$.



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