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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	DIFFERENTIATION
PAPER TYPE:	SOLUTION - 10
TOTAL QUESTIONS	8
TOTAL MARKS	43

1)

Inner function: g(x) = cos(x^2)

Outer function: h(x) = e^x

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

1. Find h-1(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) = -2x sin(x^2)

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

   F'(x) = h'(g(x)) . g'(x) = $e^{cos(x^2)}$. (-2x sin(x^2))

   So, the derivative of f(x) = $e^{cos(x^2)}$ using the chain rule is f'(x) = -2x sin(x^2) $e^{cos(x^2)}$.

2)

To differentiate this function using the chain rule, we first identify the inner function and its derivative. In this case, the inner function is u(x) = $2x^2$ + 3x, and its derivative is u'(x) =4x + 3.

Next, we differentiate the outer function sin(u) with respect to u, which gives us cos(u).

Finally, applying the chain rule, we multiply the derivative of the outer function with the derivative of the inner function:

f'(x) = cos($2x^2$ + 3x) . (4x + 3)

So, the derivative of f(x) = sin($2x^2$ + 3x) is f'(x) = (4x + 3) cos ($2x^2$ + 3x).

3)

To find the derivative of g(x), we apply the chain rule. First, we identify the inner function and its derivative in this case, the inner function is u(x) = $3x^2$ – 2x, and its derivative is u'(x) = 6x -2.

Next, we differentiate the outer function e^u with respect to u, which gives us e^u.

Finally, applying the chain rule, we multiply the derivative of the outer function with the derivative of the inner function:

g'(x) = e^{2x^2} . (6x – 2)

So, the derivative of g(x) = e^{3x^2-2x} is g'(x) = (6x – 2) e^{3x^2-2x}.

4)

First, identify the inner function and its derivative. In this case, the inner function is u(x) = $2x^2 - x^2 + 1$, and its derivative is u'(x) = $6x^2 - 2x$.

Next, differentiate the outer function $\sqrt{u}$ with respect to u, which gives us $\frac{1}{2\sqrt{u}}$.

Finally, apply the chain rule by multiplying the derivative of the outer function with the derivative of the inner function:

h'(x) = $\frac{1}{2\sqrt{2x^2-x^2+1}}$. (6x2 – 2x)

Simplifying, we get:

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

So, the derivative of h(x) = $\sqrt{2x^2 - x^2 + 1}$ is h'(x) = $\frac{3x^2 - x}{\sqrt{2x^2-x^2+1}}$

5)

To find the derivative of y(x), we apply the chain rule. First identify the inner function and its derivative. In this case, the inner function is u(x) = $5x^2 - 3x + 2$, and its derivative is u'(x) = 10x – 3.

Next, differentiate the outer function ln(x) with respect to u, which gives us $\frac{1}{u}$.

Finally, apply the chain rule by multiplying the derivative of the outer function with the derivative of the inner function:

y'(x) = $\frac{1}{5x^2-3x+2}$. (10x – 3)

Simplifying, we get:

y'(x) = $\frac{1}{5x^2-3x+2}$

So, the derivative of y(x) = ln(5x2 – 3x + 2) is y'(x) = $\frac{10x-3}{5x^2-3x+2}$.

6)

To find the derivative of f(x), we apply the chain rule. First, identify the inner function and its derivative. In this case, the inner function is u(x) = 2x + 1, and its derivative is u'(x) = 2.

Next, differentiate the outer function u^4 with respect to u, which gives us $4u^3$.

Finally, apply the chain rule by multiplying the derivative of the outer function with the derivative of the inner function:

F'(x) = $4(2x + 1)^3$ .2

Simplifying, we get:

f'(x) = $8(2x + 1)^3$

So, the derivative of f(x) = $(2x + 1)^4$ is f'(x) = $8(2x + 1)^3$.

7)

To find the derivative of y(x), we apply the chain rule. First, identify the inner function and its derivative. In this case, the inner function is u(x) = 2x2 – x, and its derivative is u'(x) = 4x – 1.

Next, derivative the outer function cos(u) with respect to u, which give us – sin(u).

Finally, apply the chain rule by multiplying the derivative of the outer function with the derivativfe of the inner function:

y'(x) = - sin($2x^2$ – x) . (4x – 1)

So, the derivativfe of y(x) = cos($2x^2$ – x) is y'(x) = - (4x – 1) sin ($2x^2$ – x).

8)

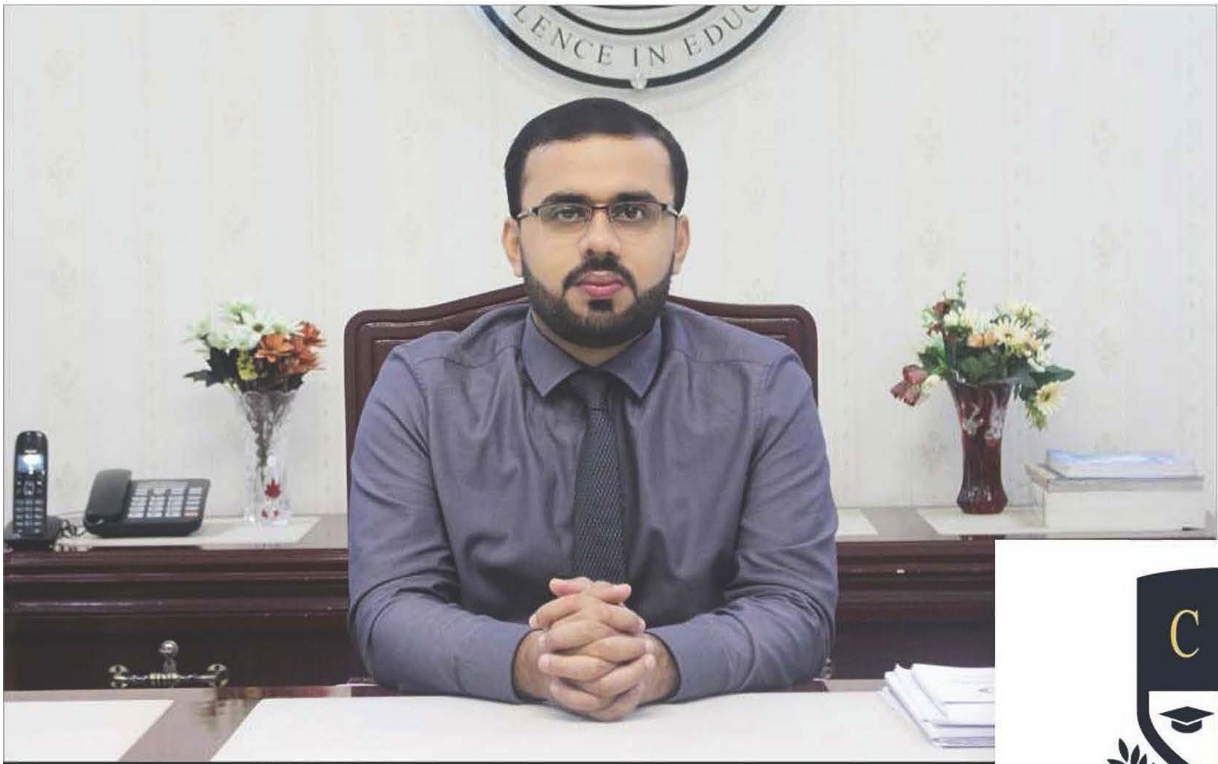
To find the derivative of f(x), we apply the chain rule. First, identify the inner function and its derivative. In this case, the inner function is u(x) = 2x3 – x, and its derivative is u'(x) = 6x2 – 1.

Next, differentiate the outer function e^u with respect to u, which gives us e^u.

Finally, apply the chain rule by multiplying the derivative of the outer function with the derivative of the inner function:

$f(x) = e^{2x^3 - x} . (6x^2 - 1)$

So, the derivae $f(x) = e^{2x^3 - x}$ is $f'(x) = (6x^2 - 1)\, e^{2x^3 - x}$.



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