المادة: الرياضيات
المرحلة: الاولى
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Lecture (2)

جامعة المستقبل
كلية الهندسة والتقنيات الهندسة
تقنيات الوقود والطاقة

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Sums, Difference, Product and Quotients of Functions:
جمع، طرح، ضرب وقسمة الدوال

Definition: If F and G are functions, then we define the functions

- ✓ Sum → (F+G)(x)= F(x)+G(x)
- ✓ Difference → (F - G)(x)= F(x) - G(x)
- ✓ Product → (F * G)(x)= F(x) *G(x)
- ✓ Quotient → (F / G)(x)= F(x) /G(x) , where $g(x) \neq 0$

Example 1: Combining Functions Algebraically

The function defined by the formulas

f (x) =$\sqrt{x}$ and g(x) = $\sqrt{1-x}$

Function	Formula
$f+g$	$(f+g)(x)=\sqrt{x}+\sqrt{1-x}$
$f-g$	$(f-g)(x)=\sqrt{x}-\sqrt{1-x}$
$g-f$	$(g-f)(x)=\sqrt{1-x}-\sqrt{x}$
$f\circ g$	$(f\circ g)(x)=f(x)g(x)=\sqrt{x(1-x)}=\sqrt{x-x^2}$
f/g	$\frac{f}{g}(x)=\frac{f(x)}{g(x)}=\sqrt{\frac{x}{1-x}}$
g/f	$\frac{g}{f}(x)=\frac{g(x)}{f(x)}=\sqrt{\frac{1-x}{x}}$

H.W: Combining Functions Algebraically The function defined by the formulas **f (x) = 3x and g(x) = $1-x^2$** .

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Composition of Functions: (تركيب الدوال)

DEFINITION: If f and g are functions, the composite (f ₒ g) ((f composed with g)) or g ₒ f ((g composed with f)) are defined by:
(f o g)(x) = f (g(x)) and $(g \circ f)(x) = g(f(x))$ respectively

Examples 1: Find the formula for (f o g)(x) and $(g \circ f)(x)$ if g(x) $= \boldsymbol{x^2}$ and f(x) = x - 7,
then find the value of f(g(2)) and g(f(2)).
SOL:
A: (f o g)(x) = f (g(x)) = f ($\boldsymbol{x^2}$) = $\boldsymbol{x^2} - 7$.
f(g(2))= $\mathbf{2^2} - 7 = -3$.
B: (g o f)(x) = g (f(x)) = g(x - 7) = $(x - 7)^2$.
g(f(2))= $(2 - 7)^2 = (-5)^2$.
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Examples 2: Find the formula for (f o g)(x) and $(g \circ f)(x)$ if f(x) = $\boldsymbol{x^2} + \mathbf{1}$ and g(x) $= \sqrt{\boldsymbol{x}}$,
then find the value of f(g(3)) and g(f(3)).
SOL:
A: (f o g)(x) = f (g(x)) = f ($\sqrt{\boldsymbol{x}}$) = $(\sqrt{\boldsymbol{x}})^2 + 1 = \boldsymbol{x} + \mathbf{1}$.
f(g(3))= $\mathbf{3} + \mathbf{1} = 4$.
B: (g o f)(x) = g (f(x)) = g($\boldsymbol{x^2} + \mathbf{1}$) = $\sqrt{\boldsymbol{x^2} + \mathbf{1}}$.
g(f(3))= $\sqrt{\mathbf{3^2} + \mathbf{1}} = \sqrt{\mathbf{10}}$.
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H.W: Finding formulas for composites If f (x) = x and g(x) = x +1,
Find:
(a) (f o g)(x) **(b) (g o f)(x)** **(c) (f o f)(x)** **(d) (g o g)(x)**

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Even Function, Odd Function:(الدالة الفردية والدالة الزوجية)

A function y = f(x) is an

even function of x if $f(-x) = f(x)$

odd function of x if $f(-x) = -f(x)$

for every x in the function's domain.

Examples: Recognizing Even and Odd functions

1) $f(x) = x^2$
   $f(-x) = (-x)^2 = x^2$
   $-f(x) = -(x)^2$
   Even function

2) $f(x) = x^2 + 1$
   $f(-x) = (-x)^2 + 1 = x^2 + 1$
   $-f(x) = -(x)^2 - 1$
   Even function

3) $f(x) = x$
   $f(-x) = -x$
   $-f(x) = -x$
   odd function

4) $f(x) = x + 1$
   $f(-x) = -x + 1$
   $-f(x) = -x - 1$
   Not Even function , Not odd function

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5) $f(x) = x - 1$

$f(-x) = -x - 1$

$-f(x) = -x + 1$

Not Even function , Not odd function

6) $f(x) = x^3$

$f(-x) = (-x)^3 = -(x)^3$

$-f(x) = -(x)^3$

Odd function

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H.W:

1) $f(x) = x^3 - 3.$
2) $f(x) = x^3 + x^2 - 3$
3) $f(x) = x^2 - x$
4) $f(x) = \frac{1}{x}$

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