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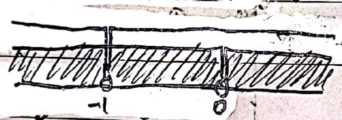
1 $f(x) = \frac{1-x}{x}$, $g(x) = \frac{x}{1+x}$ Tentukan $D_{f\pm g}$, $D_{f \cdot g}$, dan $D_{\frac{f}{g}}$

(1) Tentukan D_f dan D_g

• $D_f = \{x \in R \mid f(x) \in R\}$
$= \{x \in R \mid \frac{1-x}{x} \in R\} \rightarrow x \neq 0$
$= \{x \in R \mid x \in R, x \neq 0\}$
$= (-\infty, 0) \cup (0, \infty)$

• $D_g = \{x \in R \mid g(x) \in R\}$
$= \{x \in R \mid \frac{x}{1+x} \in R\} \rightarrow 1+x \neq 0$, $x \neq -1$
$= \{x \in R \mid x \in R, x \neq -1\}$
$= (-\infty, -1) \cup (-1, \infty)$

(2) • $D_{f+g} = ((-\infty, 0) \cup (0, \infty)) \cap ((-\infty, -1) \cup (-1, \infty))$
$=$



$= (-\infty, -1) \cup (-1, 0) \cup (0, \infty)$

• $D_{f-g} = D_f \cap D_g = (-\infty, -1) \cup (-1, 0) \cup (0, \infty)$
• $D_{f \cdot g} = D_f \cap D_g = (-\infty, -1) \cup (-1, 0) \cup (0, \infty)$
• $D_{\frac{f}{g}} = D_f \cap D_g - \{x \mid g(x) = 0\}$
$= (-\infty, -1) \cup (-1, 0) \cup (0, \infty) - \{x \mid \frac{x}{1+x} = 0\}$
$= (-\infty, -1) \cup (-1, 0) \cup (0, \infty) - \{x \mid x = 0\}$
$= (-\infty, -1) \cup (-1, 0) \cup (0, \infty)$

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$f(x) = \sqrt{x-1}$, $g(x) = 1/x^2$. Apakah $g \circ f(x)$ terdefinisi? Jika iya tentukan:
- $g(f(x))$
- $D_{g\circ f}$
- $R_{g\circ f}$

① Apakah terdefinisi? Syarat $R_f \cap D_g \neq 0$

- $D_f = \{x \in R \mid f(x) \in R\}$
$= \{x \in R \mid \sqrt{x-1} \in R\}$
$= \{x \in R \mid x-1 \geq 0\}$
$= \{x \in R \mid x \geq 1\} = [1, \infty)$

- $D_g = \{x \in R \mid g(x) \in R\}$
$= \{x \in R \mid \frac{1}{x^2} \in R\}$
$= \{x \in R \mid x \in R, x^2 \neq 0\}$
$= \{x \mid x \in R, x \neq 0\} = (-\infty, 0) \cup (0, \infty)$

- $R_f = \{f(x) \in R \mid x \in D_f\}$
$= \{\sqrt{x-1} \in R \mid x \in [1, \infty)\}$
$= \{y \mid y \in R, y \geq 0\} = [0, \infty)$

- $R_g = \{g(x) \in R \mid x \in D_g\}$
$= \{\frac{1}{x^2} \in R \mid x \in (-\infty, 0) \cup (0, \infty)\}$
$= \{y \mid y \in R, y > 0\} = (0, \infty)$

Cari invers

$y = \frac{1}{x^2} \Rightarrow x^2 = \frac{1}{y}$

$x = \frac{1}{\pm\sqrt{y}} \rightarrow y > 0$

$\Rightarrow R_f \cap D_g = [1, \infty) \cap ((-\infty, 0) \cup (0, \infty))$
$= [1, \infty)$ Terdefinisi

② $g(f(x)) = \frac{1}{(\sqrt{x-1})^2} = \frac{1}{x-1}$

- $D_{g\circ f} = \{x \in D_f \mid f(x) \in D_g\}$
$= \{x \in [1, \infty) \mid \sqrt{x-1} \in R\}$
$= \{x \geq 1 \mid x-1 \geq 0\}$
$= \{x \geq 1 \mid x \geq 1, x \in R\}$
$= (-\infty, 1) \cup (1, \infty)$

- $R_{g\circ f} = \{y \in R_g \mid y = g(t), t \in R_f\}$
$= \{y \in (0, \infty) \mid y = 1/t^2, t \in [1, \infty)\}$
$= \{y > 0 \mid t \geq 1\}$
$= \{y > 0 \mid y \in (-\infty, \infty)\}$
$= (-\infty, \infty)$

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6 $f(x) = \dfrac{x}{x-1}$, $g(x) = x^2$

Apakah $f \circ g(x)$ terdefinisi? Jika iya tentukan:

- $f(g(x))$
- $D_{f \circ g}$
- $D_{f \circ g}$

1 Apakah terdefinisi? Syaratnya $R_g \cap D_f$

- $D_f = \{x \in R \mid f(x) \in R\}$
  $= \{x \in R \mid \dfrac{x}{x-1} \in R\}$
  $= \{x \in R \mid x-1 \neq 0\}$
  $= \{x \in R \mid x \neq 1\}$
  $= \{x \mid x \in R, x \neq 1\}$

- $D_g = \{x \in R \mid g(x) \in R\}$
  $= \{x \in R \mid x^2 \in R\}$
  $= \{x \in R\}$
  $= (-\infty, \infty)$

- $R_f = \{f(x) \in R \mid x \in D_f\}$
  $= \{\dfrac{x}{x-1} \in R \mid x \in R, x \neq 1\}$
  $= \{y \mid y \in R, y \neq 1\}$
  $=$

- $R_g = \{g(x) \in R \mid x \in D_g\}$
  $= \{x^2 \in R \mid x \in (-\infty, \infty)\}$
  $= \{y \mid y \geq 0\}$
  $= [0, \infty)$

3) $R_g \cap D_f = (-\infty, \infty) \cap ((-\infty, 1) \cup (1, \infty))$
$= (-\infty, 1) \cup (1, \infty)$ Terdefinisi

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- $f(g(x)) = f(x^2)$
  $= \dfrac{x^2}{x^2-1}$

- $D_{f \circ g} = \{x \in D_g \mid g(x) \in D_f\}$
  $= \{x \in R \mid x^2 \in x \neq 1\}$
  $= \{x \in R \mid x^2 \neq 1\}$
  $= \{x \in R \mid x \neq \pm 1\}$
  $= \{x \mid x \in R, x \neq \pm 1\}$

- $R_{f \circ g} = \{y \in R_f \mid y = f(t), t \in R_g\}$
  $= \{y \in R, y \neq 1 \mid y = \dfrac{t}{t-1}, t \in [0, \infty)\}$
  $= (-\infty, 0] \cup (1, \infty)$

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c $f(x) = \sqrt{16-x}$, $g(x) = x^4$

Apakah $f \circ g(x)$ terdefinisi? Jika iya tentukan:

- $f(g(x))$
- $D_{f \circ g}$
- $D_{f \circ g}$

(1) Apakah terdefinisi? Syaratnya $R_g \cap D_f$

- $D_f = \{x \in R \mid f(x) \in R\}$
$= \{x \in R \mid \sqrt{16-x} \in R\}$
$= \{x \in R \mid 16 - x \geq 0\}$
$= \{x \in R \mid x \leq 16\}$
$= (-\infty, 16]$

- $D_g = \{x \in R \mid g(x) \in R\}$
$= \{x \in R \mid x^4 \in R\}$
$= \{x \in R \mid x \in R\}$
$= (-\infty, \infty)$

- $R_f = \{f(x) \in R \mid x \in D_f\}$
$= \{\sqrt{16-x} \in R \mid x \in (-\infty, 16]\}$
$= \{y \mid y \geq 0\}$
$= [0, \infty)$

- $R_g = \{g(x) \in R \mid x \in D_g\}$
$= \{x^4 \in R \mid x \in R\}$
$= \{y \mid y \geq 0\}$
$= [0, \infty)$

$\Rightarrow R_g \cap D_f = [0, \infty) \cap (-\infty, 16]$
$= [0, 16]$ Terdefinisi

(2) - $f(g(x)) = f(x^4)$
$= \sqrt{16 - x^4}$

- $D_{f \circ g} = \{x \in D_g \mid g(x) \in D_f\}$
$= \{x \in R \mid x^4 \in (-\infty, 16]\}$ → x^4 tidak mungkin negatif
$= \{x \in R \mid 0 \leq x^4 \leq 16\}$
$= \{x \in R \mid -2 \leq x \leq 2\} = [-2, 2]$

- $R_{f \circ g} = \{y \in R_f \mid y = f(t), t \in R_g\}$
$= \{y \in [0, \infty) \mid y = \sqrt{16-t}, t \in [0, \infty)\}$
$= \{y \geq 0 \mid t \leq 16, t \geq 0\}$
$= \{y \geq 0 \mid y \geq 0, y \leq 4\}$
$= [0, 4]$