

## Cl4a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

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Cl4a.

Cl4a.



Created By

**cohtran**

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Finding the condition for the function which always increases or decreases on its domain depending on derivative is an important application in calculus . With the properties of the 1st derivative sign , we can determine the interval of increasing or decreasing behavior of function and also calculate the interval of parameters that satisfied the monotonicity given .

Việc tìm các yếu tố cho hàm số luôn luôn tăng hay giảm trên miền xác định như vào đạo hàm là một ứng dụng rất quan trọng trong giải tích . Bằng các tính chất của đạo hàm cấp 1 , chúng ta có thể xác định được khoảng tăng giảm của hàm số , yếu tố đó cũng có thể tính được khoảng các tham số thỏa mãn số đơn điệu cho trước .

Author :

Co.H.Tran

MMPG VN

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## CI4a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

Flash Card 1 of 9

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Hello ,  
Conditions for the function  
increasing or decreasing on the  
domain\_Đ/kiện để hàm tăng hay  
giảm trên tập xác định .



**Step 1 .**

Find the domain of the given  
function

$y = f(x,m)$  [  $m$  : parameter ,  $x$  :  
variable ]

Tìm tập xác định của hàm số đã cho

$y = f(x,m)$  [  $m$  : tham số ,  $x$  : biến số ]

Repeat

Flip

? keyboard shortcuts

PREV

NEXT

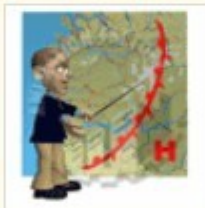
## CI4a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

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Use the properties of 1st derivative :

$y' > 0$  ,  $y = f(x)$  increases /

$y' < 0$  ,  $y = f(x)$  decreases |



**Step 2 .**

Calculate the 1st derivative  $y' = f'(x,m)$  .

Tính đạo hàm cấp 1 :  $y' = f'(x,m)$  .

Repeat

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Case I : For the 3rd polynomial

\* Cubic :

$$y = ax^3 + bx^2 + cx + d ; D = \mathbb{R}$$



$$y = ax^3 + bx^2 + cx + d ; \\ D = \mathbb{R}$$

Step 3.

Use the properties of 1st derivative :

$$*** y' > 0 , y = f(x) \text{ increases } /$$

$$\Leftrightarrow \{ a > 0 , y' \geq 0 \}$$

$$\Leftrightarrow \{ a > 0 , y' = 3ax^2 + 2bx + c \geq 0 \}$$

$$\Leftrightarrow \{ a > 0 , \Delta = 4b^2 - 12ac \leq 0 \}$$

Repeat

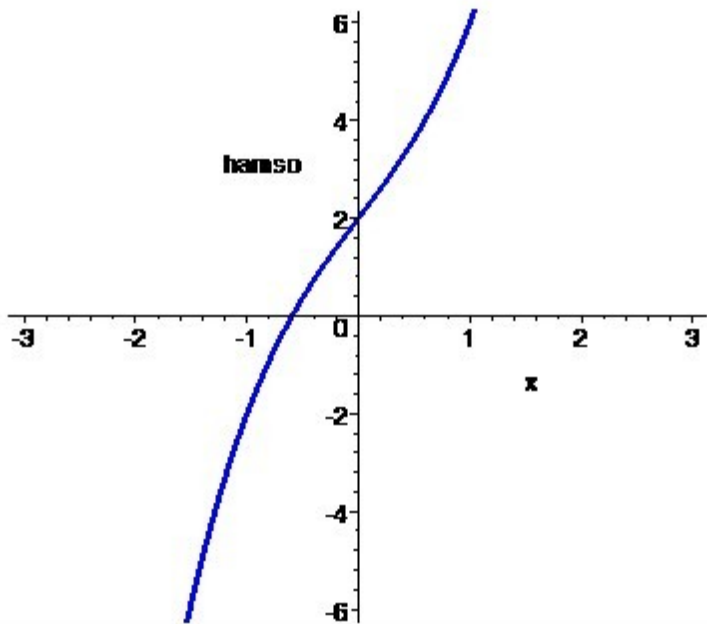
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PREV

NEXT

$w = 1.5549$



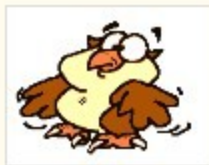
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See details of Case I , step3  
(cont')



---

$$y = ax^3 + bx^2 + cx + d ;$$
$$D = \mathbb{R}$$

$$***y' < 0, y = f(x) \text{ decreases } \setminus$$
$$\Leftrightarrow \{ a < 0, y' \leq 0 \}$$

$$\Leftrightarrow \{ a < 0, y' = 3ax^2 + 2bx + c \leq 0 \}$$

$$\Leftrightarrow \{ a < 0, \Delta = 4b^2 - 12ac \leq 0 \}$$

← PREV

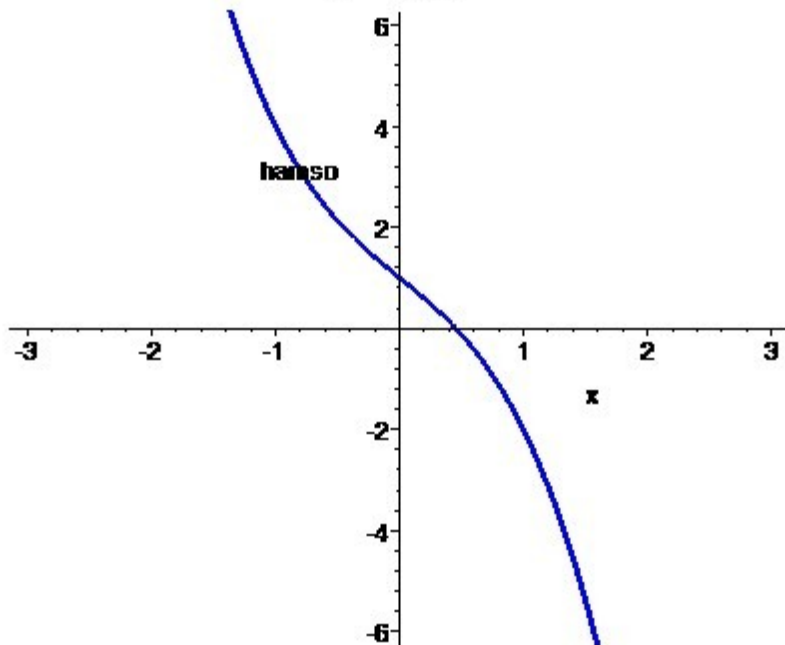
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↺ Repeat

↻ Flip

? keyboard shortcuts

$w = 1.6184$



# C14a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

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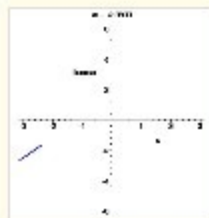
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**Case II** : For the rational function

$$y = (ax^2 + bx + c) / (dx + f)$$



$$y = (ax^2 + bx + c) / (dx + f)$$

**Step 3.**

Use the properties of 1st derivative :

$$*** y' > 0, y = f(x) \text{ increases } /$$

$$\Leftrightarrow \{ ad > 0, y' \geq 0 \}$$

$$\Leftrightarrow \{ ad > 0, y' = (adx^2 + 2afx + bf - dc) / (dx + f)^2 \geq 0 \}$$

$$\Leftrightarrow \{ ad > 0, \Delta = 4a^2f^2 - 4ad \cdot (bf - dc) \leq 0 \}$$

PREV

NEXT

Repeat

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$$y = (ax^2 + bx + c) / (dx + f)$$

### Step 3.

Use the properties of 1st derivative :

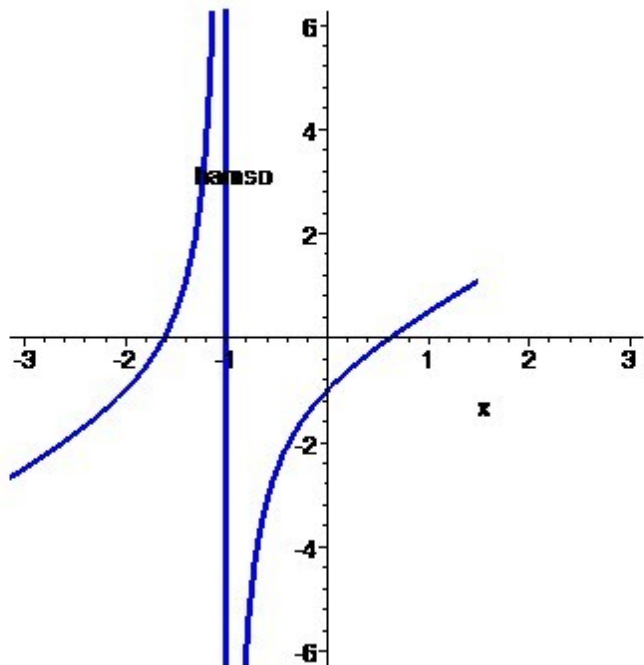
\*\*\*  $y' > 0$  ,  $y = f(x)$  increases /

$$\Leftrightarrow \{ ad > 0 , y' \geq 0 \}$$

$$\Leftrightarrow \{ ad > 0 , y' = (adx^2 + 2afx + bf - dc) / (dx+f)^2 \geq 0 \}$$

$$\Leftrightarrow \{ ad > 0 , \Delta = 4a^2f^2 - 4ad \cdot (bf - dc) \leq 0 \}$$

$w = 1.4915$



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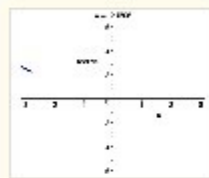
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with list

See details of Case II , step3  
(cont')



$$y = \frac{ax^2 + bx + c}{dx + f}$$

\*\*\*  $y' < 0$  ,  $y = f(x)$  decreases

$$\Leftrightarrow \{ ad < 0 , y' \leq 0 \}$$

$$\Leftrightarrow \{ da < 0 , y' = \frac{adx^2 + 2afx + bf - dc}{(dx+f)^2} \leq 0 \}$$

$$\Leftrightarrow \{ ad < 0 , \Delta = 4a^2f^2 - 4ad \cdot (bf - dc) \leq 0 \}$$

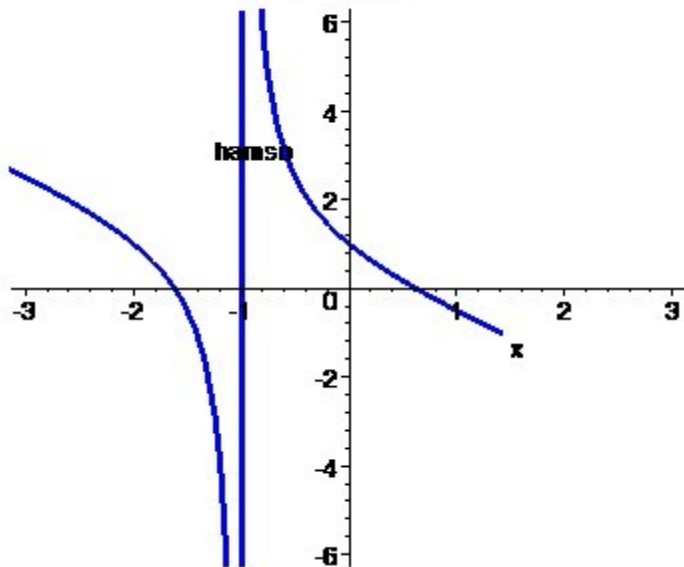
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Repeat

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$w = 1.4280$



# CI4a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

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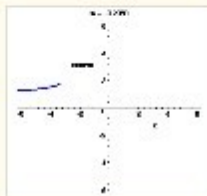
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**Case III : For the rational function**

$$y = (ax + b) / (cx + d)$$



$$y = (ax + b) / (cx + d)$$

**Step 3.**

Use the properties of 1st derivative :

$$*** y' > 0, y = f(x) \text{ increases } /$$

$$\Leftrightarrow \{ y' > 0 \}$$

$$\Leftrightarrow \{ y' = (ad - bc) / (cx + d)^2 > 0 \}$$

$$\Leftrightarrow ad - bc > 0$$

← PREV

NEXT →

↻ Repeat

↺ Flip

? keyboard shortcuts

$$y = (ax + b) / (cx + d)$$

**Step 3.**

Use the properties of 1st derivative :

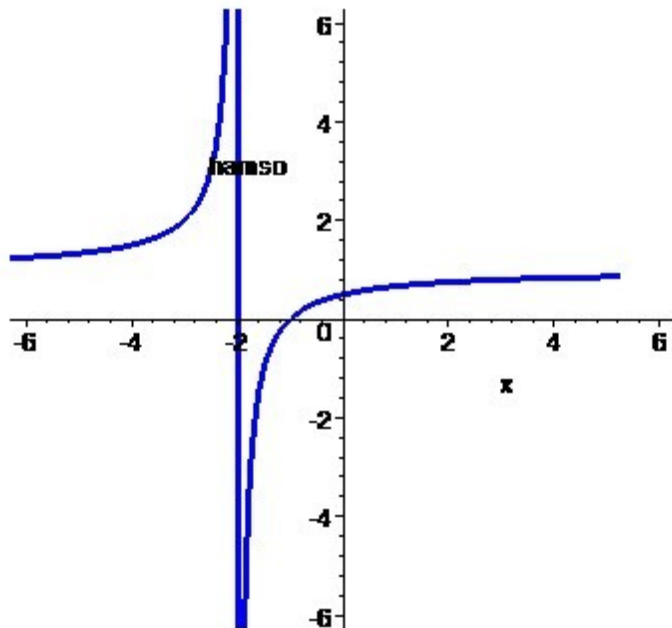
\*\*\*  $y' > 0$  ,  $y = f(x)$  increases /

$$\Leftrightarrow \{ y' > 0 \}$$

$$\Leftrightarrow \{ y' = (ad - bc) / (cx + d)^2 > 0 \}$$

$$\Leftrightarrow ad - bc > 0$$

$w = 5.2677$



# CI4a.Function increasing / decreasing on the domain\_Hàm số tăng giảm MXĐ

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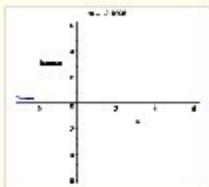
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See details of Case III , step3  
(cont')



---

$$y = (ax + b) / (cx + d)$$

\*\*\*  $y' < 0$  ,  $y = f(x)$  decreases |

$$\Leftrightarrow \{ y' < 0 \}$$

$$\Leftrightarrow \{ y' = (ad - bc) / (cx + d)^2 < 0 \}$$

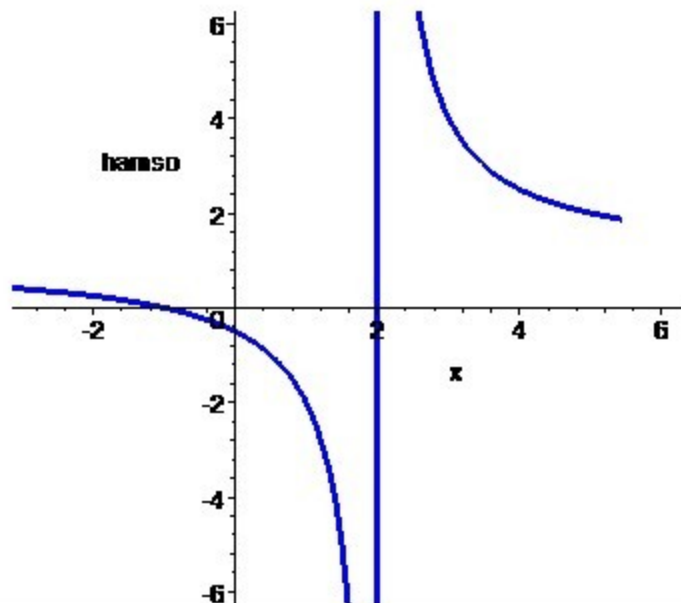
$$\Leftrightarrow ad - bc < 0$$

← PREV

NEXT →



$w = 5.4264$





Repeat

Flip

GOODBYE



THANKS FOR YOUR JOINING  
US ,

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PREV

NEXT

keyboard shortcuts