Dérivées : solutions

Dérive les expressions suivantes :

a) $(4x)' = 4$

b) $(2x^2 - 5x + 7)' = 4x - 5$

c) $\left(-\frac{x}{3}\right)' = \frac{-1}{3}$

d) $(\sqrt{x} + 4x - 1)' = \left(x^{\frac{1}{2}} + 4x - 1\right)' = \frac{1}{2\sqrt{x}} + 4$

e) $\left(\frac{1-2x}{3x-1}\right)' = \frac{(1-2x)'.(3x-1)-(1-2x).(3x-1)'}{(3x-1)^2} = \frac{-2.(3x-1)-(1-2x).3}{(3x-1)^2}$

$$= \frac{-6x + 2 - 3 + 6x}{(3x-1)^2} = \frac{-1}{(3x-1)^2}$$

f) $(x + \cos x)' = 1 - sinx$

g) $(3\sin x - 2\cos x)' = 3cosx + 2\ \sin x$

h) $((2+x)(1-5x))' = (2+x)'(1-5x) + (2+x)(1-5x)' = 1(1-5x) + (2+x).(-5) =$
$1 - 5x - 10 - 5x = -10x - 9$

i) $((x^4-1)(2x+3))' = (x^4-1)'(2x+3) + (x^4-1)(2x+3)' = 4x^3(2x+3) + (x^4 -$
$1).2 = 8x^4 + 12x^3 + 2x^4 - 2 = 10x^4 + 12x^3 - 2$

j) $((x-x^2)(3x))' = (x-x^2)'.3x + (x-x^2).(3x)' = (1-2x).3x + (x-x^2).3 = 3x - 6x^2 +$
$3x - 3x^2 = -9x^2 + 6x$

k) $(x^2.\cos x)' = (x^2)'.\cos x + x^2.(\cos x)' = 2x.\cos x - x^2.\sin x$

l) $(sinx.cosx)' = (sinx)'.cosx + sinx.(cosx)' = cosx.cosx + sinx.(-sinx) = cos^2x - sin^2x$

m) $\left(\frac{2x^3}{x^2-1}\right)' = \frac{(2x^3)'.(x^2-1)-2x^3.(x^2-1)'}{(x^2-1)^2} = \frac{6x^2.(x^2-1)-2x^3.2x}{(x^2-1)^2} = \frac{6x^4-6x^2-4x^4}{(x^2-1)^2} = \frac{2x^4-6x^2}{(x^2-1)^2}$

n) $\left(\frac{4x^2+3x-1}{2x+1}\right)' = \frac{(4x^2+3x-1)'(2x+1)-(4x^2+3x-1).(2x+1)'}{(2x+1)^2} = \frac{(8x+3)(2x+1)-(4x^2+3x-1).2}{(2x+1)^2} =$
$\frac{16x^2+8x+6x+3-8x^2-6x+2}{(2x+1)^2} = \frac{8x^2+8x+5}{(2x+1)^2}$

o) $((x^3-5x)(2x^2-4))' = (x^3-5x)'(2x^2-4) + (x^3-5x)(2x^2-4)' = (3x^2 -$
$5).(2x^2-4) + (x^3-5x).4x = 6x^4 - 12x^2 - 10x^2 + 20 + 4x^4 - 20x^2 = 10x^4 -$
$42x^2 + 20$

p) $\left(x + \frac{x^2-1}{x^2+1}\right)' = 1 + \frac{(x^2-1)'.(x^2+1)-(x^2-1).(x^2+1)'}{(x^2+1)^2} = 1 + \frac{2x.(x^2+1)-(x^2-1).2x}{(x^2+1)^2} = 1 + \frac{2x^3+2x-2x^3+2x}{(x^2+1)^2} =$
$1 + \frac{4x}{(x^2+1)^2}$

Dérivées de fonctions composées

a) $((3x+4)^2)' = 2.(3x+4).(3x+4)' = 2.(3x+4).3 = 6.(3x+4)$

b) $((x-x^2)^3)' = 3.(x-x^2)^2.(x-x^2)' = 3.(x-x^2)^2.(1-2x)$

c) $((2-4x)^3)' = 3.(2-4x)^2.(2-4x)' = 3.(2-4x)^2.(-4) = -12.(2-4x)^2$

d) $\left(\frac{3}{(2x+1)^2}\right)' = (3.(2x+1)^{-2})' = 3.(-2).(2x+1)^{-3}.(2x+1)' = -6.(2x+1)^{-3}.2 =$

$-12.(2x+1)^{-3} = \frac{-12}{(2x+1)^3}$

e) $(cos^3 2x)' = ((\cos 2x)^3)' = 3.(\cos 2x)^2.(\cos 2x)' = 3.(\cos 2x)^2.(-2)\sin 2x =$

$-6.cos^2 2x.sin 2x$

f) $(\cos(2x-4))' = -(2x-4)'.\sin(2x-4) = -2.\sin(2x-4)$

g) $\left(\left(\frac{1+x}{1-x}\right)^2\right)' = 2.\left(\frac{1+x}{1-x}\right).\left(\frac{1+x}{1-x}\right)' = 2.\left(\frac{1+x}{1-x}\right).\frac{(1+x)'.(1-x)-(1+x).(1-x)'}{(1-x)^2} =$

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

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

i) $\left(sin^2(3x+2)\right)' = ((\sin(3x+2))^2)' = 2.(\sin(3x+2).(\sin(3x+2))' =$

$2.\sin(3x+2).3\cos(3x+2) = 6.\sin(3x+2).\cos(3x+2)$

j) $\left(\sqrt{3x}\right)' = \left((3x)^{\frac{1}{2}}\right)' = \frac{1}{2}.(3x)^{\frac{1}{2}-1}.(3x)' = \frac{1}{2}.(3x)^{\frac{-1}{2}}.3 = \frac{3}{2.\sqrt{3x}}$

k) $(tg\ 4x)' = \frac{(4x)'}{cos^2 4x} = \frac{4}{cos^2 4x}$

l) $(\sqrt{x^2 - 4x}\,)' = ((x^2 - 4x)^{\frac{1}{2}})' = \frac{1}{2}.(x^2 - 4x)^{\frac{1}{2}-1}.(x^2 - 4x)' = \frac{1}{2}(x^2 - 4x)^{\frac{-1}{2}}.(2x - 4) =$

$\frac{1}{2}.(x^2 - 4x)^{\frac{-1}{2}}.2(x - 2) = \frac{x-2}{\sqrt{x^2-4x}}$

m) $((3x^2 - 1)^3)' = 3.(3x^2 - 1)^2.(3x^2 - 1)' = 3.(3x^2 - 1)^2.6x = 18x.(3x^2 - 1)^2$

n) $\left(\frac{1}{\sqrt{3x^4-2x}}\right)' = \left((3x^4 - 2x)^{\frac{-1}{2}}\right)' = \frac{-1}{2}.(3x^4 - 2x)^{\frac{-1}{2}-1}.(3x^4 - 2x)'$

$$= \frac{-1}{2}.(3x^4 - 2x)^{\frac{-3}{2}}.(12x^3 - 2) = \frac{-1}{2}.(3x^4 - 2x)^{\frac{-3}{2}}.2.(6x^3 - 1)$$

$$= \frac{6x^3 - 1}{\sqrt{(3x^4 - 2x)^3}}$$

o) $\left(sin^6(3x - 5)\right)' = (((\sin(3x - 5))^6)' = 6.(\sin(3x - 5))^5.(\sin(3x - 5))' =$

$6.(\sin(3x - 5))^5.3.\cos(3x - 5) = 18.sin^5(3x - 5).\cos(3x - 5)$

Exercices variés :

a) $(-6x^5-3x^4+2x-1)' = -30x^4-12x^3+2$

b) $((-5x^2-3x+1)^3)' = 3.(-5x^2-3x+1)^2.(-5x^2-3x+1)' =$

$3.(-5x^2-3x+1)^2.(-10x-3)$

c) $\left(\frac{3x^2-4x}{2-3x}\right)' = \frac{(3x^2-4x)'.(2-3x)-(3x^2-4x).(2-3x)'}{(2-3x)^2} =$

$\frac{(6x-4).(2-3x)-(3x^2-4x).(-3)}{(2-3x)^2} = \frac{12x-18x^2-8+12x+9x^2-12x}{(2-3x)^2} = \frac{-9x^2+12x-8}{(2-3x)^2}$

d) $(\cos(2x-4))' = -(2x-4)'.\sin(2x-4) = -2.\sin(2x-4)$

e) $(x^2.sin3x)' = (x^2)'.\sin 3x + x^2.(\sin 3x)' = 2x.\sin 3x + x^2.(3x)'.\cos 3x =$

$2x.sin3x + 3x^2.cos3x$

f) $\left(5x^2.(2x+1)\right)' = (5x^2)'.(2x+1) + 5x^2.(2x+1)' = 10x.(2x+1) + 5x^2.2 =$

$20x^2+10x+10x^2 = 30x^2+10x$

g) $\left(x.\sqrt{x}\right)' = \left(x^1.x^{\frac{1}{2}}\right)' = \left(x^{1+\frac{1}{2}}\right)' = \left(x^{\frac{3}{2}}\right)' = \frac{3}{2}.x^{\frac{1}{2}} = \frac{3}{2}\sqrt{x}$

h) $\left(\frac{x^3+1}{x^3-1}\right)' = \frac{(x^3+1)'.(x^3-1)-(x^3+1).(x^3-1)'}{(x^3-1)^2} = \frac{(3x^2).(x^3-1)-(x^3+1).3x^2}{(x^3-1)^2} =$

$\frac{3x^5-3x^2-3x^5-3x^2}{(x^3-1)^2} = \frac{-6x^2}{(x^3-1)^2}$

i) $\left(\sqrt{2-3x}\right)' = \left((2-3x)^{\frac{1}{2}}\right)' = \frac{1}{2}.(2-3x)^{\frac{-1}{2}}.(2-3x)' = \frac{1}{2}.\frac{1}{(2-3x)^{\frac{1}{2}}}.(-3) =$

$\frac{-3}{2.\sqrt{2-3x}}$

j) $\left(cosx.(sin^2x+2)\right)' = (cosx)'.(sin^2x+2) + cosx.(sin^2x+2)' =$

$-sinx.(sin^2x+2) + cosx.2sinx.cosx = -sinx.(sin^2x+2) + 2sinxcos^2x$

k) $(tg^2 3x)' = ((tg3x)^2)' = 2.tg3x.(tg3x)' = 2.tg3x.\frac{3}{cos^2 3x} = 6\frac{tg3x}{cos^2 3x}$

l) $\left(\frac{x^2+x+1}{1-x}\right)' = \frac{(x^2+x+1)'.(1-x)-(x^2+x+1).(1-x)'}{(1-x)^2} = \frac{(2x+1).(1-x)-(x^2+x+1).(-1)}{(1-x)^2} =$

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

m) $\left((4x^2-5x+1).(2x-3)^3\right)' = (4x^2-5x+1)'.(2x-3)^3 + (4x^2-5x+1).((2x-3)^3)' = (8x-5).(2x-3)^3 + (4x^2-5x+1).3.(2x-3)^2.2 =$

$(8x-5).(2x-3)^3 + 6.(4x^2-5x+1).(2x-3)^2$

n) $\left(\frac{2x-1}{(3x+2)^2}\right)' = \frac{(2x-1)'.(3x+2)^2-(2x-1).((3x+2)^2)'}{((3x+2)^2)^2} = \frac{2.(3x+2)^2-(2x-1).2.(3x+2).3}{(3x+2)^4} =$

$\frac{2.(3x+2)^2-6.(2x-1).(3x+2)}{(3x+2)^4} = \frac{2.(3x+2).((3x+2)-3.(2x-1))}{(3x+2)^4} = \frac{2.(3x+2-6x+3)}{(3x+2)^4} =$

$\frac{2.(-3x+5)}{(3x+2)^4}$

o) $\left(\frac{(3x^2+2x)^2}{2x-3}\right)' = \frac{((3x^2+2x)^2)'.(2x-3)-(3x^2+2x)^2.(2x-3)'}{(2x-3)^2} =$

$\frac{2.(3x^2+2x).(3x^2+2x)'.(2x-3)-(3x^2+2x)^2.2}{(2x-3)^2} =$

$\frac{2.(3x^2+2x).(6x+2).(2x-3)-2.(3x^2+2x)}{(2x-3)^2} = \frac{2.(3x^2+2x).((6x+2).(2x-3)-1)}{(2x-3)^2} =$

$\frac{2.(3x^2+2x).(12x^2-18x+4x-6-1)}{(2x-3)^2} = \frac{2.(3x^2+2x).(12x^2-14x-7)}{(2x-3)^2}$

Ecris l'équation de la tangente au graphique de la fonction f au point d'abscisse a.

a) $f(x) = x^2 + 5x - 2$ $\qquad a = 1$

$$T \equiv y - f(1) = f'(1).(x - 1)$$

- $f(1) = 1^2 + 5.1 - 2 = 4$
- $f'(x) = 2x + 5$
- $f'(1) = 2.1 + 5 = 7$

$$T \equiv y - 4 = 7.(x - 1)$$

$$T \equiv y = 7x - 3$$

b) $f(x) = x^2(x + 2)$ $\qquad a = -1$

$$T \equiv y - f(-1) = f'(-1).(x - (-1))$$

- $f(-1) = (-1)^2.(-1 + 2) = 1$
- $f'(x) = 2x.(x + 2) + x^2.1 = 2x^2 + 4x + x^2 = 3x^2 + 4x$
- $f'(-1) = 3.(-1)^2 + 4.(-1) = -1$

$$T \equiv y - 1 = -1.(x + 1)$$

$$T \equiv y = -x$$

c) $f(x) = x^3 - 3x^2$ $\qquad a = 2$

$$T \equiv y - f(2) = f'(2).(x - 2)$$

- $f(2) = 2^3 - 3.2^2 = -4$
- $f'(x) = 3x^2 - 6x$
- $f'(2) = 3.2^2 - 6.2 = 0$

$$T \equiv y + 4 = 0$$

$$T \equiv y = -4$$

d) $f(x) = \frac{4x+1}{x-3}$ $\qquad a = 0$

$$T \equiv y - f(0) = f^{'}(0).(x-0)$$

- $f(0) = \frac{-1}{3}$
- $f^{'}(x) = \frac{4.(x-3)-(4x+1).1}{(x-3)^2} = \frac{4x-12-4x-1}{(x-3)^2} = \frac{-13}{(x-3)^2}$
- $f^{'}(0) = \frac{-13}{9}$

$$T \equiv y + \frac{1}{3} = \frac{-13}{9}.x$$

$$T \equiv y = \frac{-13}{9}.x - \frac{1}{3}$$

e) $f(x) = \sqrt{5x+3}$ $\qquad a = 3$

$$T \equiv y - f(3) = f^{'}(3).(x-3)$$

- $f(3) = \sqrt{5.3+3} = \sqrt{18} = 3\sqrt{2}$
- $f^{'}(x) = \left((5x+3)^{\frac{1}{2}}\right)^{'} = \frac{1}{2}.(5x+3)^{\frac{-1}{2}}.5 = \frac{5}{2.\sqrt{5x+3}}$
- $f^{'}(3) = \frac{5}{2.\sqrt{5.3+3}} = \frac{5}{6\sqrt{2}} = \frac{5\sqrt{2}}{12}$

$$T \equiv y - 3\sqrt{2} = \frac{5\sqrt{2}}{12}.(x-3)$$

$$T \equiv y = \frac{5\sqrt{2}}{12}x + \frac{17\sqrt{2}}{4}$$

f) $f(x) = 9x^3 - 4x^2 + 5x - 1$ $\qquad a = -3$

$$T \equiv y - f(-3) = f^{'}(-3).(x-(-3))$$

- $f(-3) = 9.(-3)^3 - 4.(-3)^2 + 5.(-3) - 1 = -295$
- $f^{'}(x) = 27x^2 - 8x + 5$
- $f^{'}(-3) = 27.(-3)^2 - 8.(-3) + 5 = 272$

$$T \equiv y + 295 = 272.(x+3)$$

$$T \equiv y = 272x + 521$$

Détermine le sens de variation des fonctions suivantes :

$$f_1(x) = x^3 + 3x^2 - 4$$

$$f^{'}(x) = 3x^2 + 6x$$

Racines : $3x^2 + 6x = 0 \quad \leftrightarrow \quad 3x.(x+2) = 0 \quad \leftrightarrow \quad x = 0 \quad x = -2$

x		-2		0	
$f^{'}(x)$	$+$	0	$-$	0	$+$
$f(x)$		MAX		MIN	

- ❖ $x = -2 \quad y = (-2)^3 + 3.(-2)^2 - 4 = 0$
  - ⇨ MAX en $(-2; 0)$
- ❖ $x = 0 \quad y = 0^3 + 3.0^2 - 4 = -4$
  - ⇨ MIN en $(0; -4)$

$$f^{''}(x) = 6x + 6$$

Racine : $6x + 6 = 0 \quad \leftrightarrow x = -1$

x		-1	
$f^{''}(x)$	$-$	0	$+$
$f(x)$	$\cap$	PI	$\cup$

- ❖ $x = -1 \quad y = (-1)^3 + 3.(-1)^2 - 4 = -1 + 3 - 4 = -2$
  - ⇨ PI en $(-1; -2)$

$$f_2(x) = -3x^2 + 4x + 5$$

$$f'(x) = -6x + 4$$

Racine : $-6x + 4 = 0 \quad \leftrightarrow \quad x = \frac{2}{3}$

x		$\frac{2}{3}$	
$f'(x)$	$+$	0	$-$
$f(x)$		MAX	

- ❖ $x = \frac{2}{3} \qquad y = -3.\left(\frac{2}{3}\right)^2 + 4.\frac{2}{3} + 5 = \frac{-4}{3} + \frac{8}{3} + 5 = \frac{19}{3}$

  ⇨ $MAX\ en\ \left(\frac{2}{3}; \frac{19}{3}\right)$

$$f''(x) = -6$$

Pas de racine

x	
-6	$-\quad-\quad-$

Pas de PI

$$f_3(x) = -x^3 + 3x^2 + 1$$

$$f'(x) = -3x^2 + 6x$$

Racines : $-3x^2 + 6x = 0 \quad \leftrightarrow \quad 3x.(-x+2) = 0 \quad \leftrightarrow \quad x = 0 \qquad x = 2$

x		0		2	
$f'(x)$	$-$	0	$+$	0	$-$
$f(x)$		MIN		MAX	

- $x = 0 \qquad y = -0^3 + 3.0^2 + 1 = 1$
  - MIN en $(0; 1)$
- $x = 2 \qquad y = -2^3 + 3.2^2 + 1 = -8 + 12 + 1 = 5$
  - MAX en $(2; 5)$

$$f''(x) = -6x + 6$$

Racine : $-6x + 6 = 0 \qquad \leftrightarrow x = 1$

x		1	
$f''(x)$	$+$	0	$-$
$f(x)$	$\cup$	PI	$\cap$

- $x = 1 \qquad y = -1^3 + 3.1^2 + 1 = -1 + 3 + 1 = 3$
  - PI en $(1; 3)$

$$f_4(x) = (x+1).(x-1)^3$$

$$f'(x) = (x+1)'.(x-1)^3 + (x+1).((x-1)^3)' = 1.(x-1)^3 + (x+1).3.(x-1)^2.1$$

$$= (x-1)^2.\big((x-1) + 3.(x+1)\big) = (x-1)^2.(x-1+3x+3)$$

$$= (x-1)^2.(4x+2)$$

Racines : $(x-1)^2.(4x+2) = 0 \quad \leftrightarrow x = 1 \quad x = \frac{-1}{2}$

x		$\frac{-1}{2}$		1	
$(x-1)^2$	$+$	$+$	$+$	0	$+$
$4x+2$	$-$	0	$+$	$+$	$+$
$f'(x)$	$-$	0	$+$	0	$+$
$f(x)$		MIN		$/$	

- $x = \frac{-1}{2} \qquad y = \left(\frac{-1}{2}+1\right).\left(\frac{-1}{2}-1\right)^3 = \frac{1}{2}.\frac{-27}{8} = \frac{-27}{16}$

⇨ MIN en $\left(\frac{-1}{2};\frac{-27}{16}\right)$

$$f''(x) = 2(x-1)(4x+2) + (x-1)^2.4 = 2(x-1)2(2x+1) + (x-1)^2.4$$

$$= 4(x-1)(2x+1+x-1) = 4(x-1)3x = 12x(x-1)$$

Racines : $12x(x-1) = 0 \quad \leftrightarrow x = 0 \quad x = 1$

x		0		1	
$12x$	$-$	0	$+$	$+$	$+$
$x-1$	$-$	$-$	$-$	0	$+$
$f''(x)$	$+$	0	$-$	0	$+$
$f(x)$	$\cup$	PI	$\cap$	PI	$\cup$

- ❖ $x = 0$ $\quad y = (0+1).(0-1)^3 = 1.(-1) = -1$
  - ⇨ PI en $(0;-1)$
- ❖ $x = 1$ $\quad y = (1+1).(1-1)^3 = 0$
  - ⇨ PI en $(1;0)$

$$f_5(x) = \frac{x^2 - 5x + 10}{x - 2}$$

$$f'(x) = \frac{(x^2 - 5x + 10)'.(x-2) - (x^2 - 5x + 10).(x-2)'}{(x-2)^2}$$

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

$$= \frac{2x^2 - 4x - 5x + 10 - x^2 + 5x - 10}{(x-2)^2} = \frac{x^2 - 4x}{(x-2)^2}$$

Racines :

- $x^2 - 4x = 0 \quad \leftrightarrow \quad x.(x-4) = 0 \quad \leftrightarrow \quad x = 0 \qquad x = 4$
- $(x-2)^2 = 0 \quad \leftrightarrow \quad x = 2$

x		0		2		4	
$x^2 - 4x$	$+$	0	$-$	$-$	$-$	0	$+$
$(x-2)^2$	$+$	$+$	$+$	0	$+$	$+$	$+$
$f'(x)$	$+$	0	$-$	$/$	$-$	0	$+$
$f(x)$		MAX		$/$		MIN	

- ❖ $x = 0$ $\quad y = -5$
  - ⇨ MAX en $(0;-5)$

- $x = 4 \qquad y = \frac{4^2-5.4+10}{4-2} = \frac{6}{2} = 3$

  ⇨ MIN en $(4; 3)$

$$f_6(x) = 4x^4 - 6x^2$$

$$f^{'}(x) = 16x^3 - 12x$$

Racines : $16x^3 - 12x = 0 \qquad \leftrightarrow 4x.(4x^2-3) = 0 \qquad \leftrightarrow x = 0 \qquad x = \frac{-\sqrt{3}}{2} \qquad x = \frac{\sqrt{3}}{2}$

x		$\frac{-\sqrt{3}}{2}$		0		$\frac{\sqrt{3}}{2}$	
$4x$	$-$	$-$	$-$	0	$+$	$+$	$+$
$4x^2-3$	$+$	0	$-$	$-$	$-$	0	$+$
$f^{'}(x)$	$-$	0	$+$	0	$-$	0	$+$
$f(x)$		MIN		MAX		MIN	

- $x = \frac{-\sqrt{3}}{2} \qquad y = 4\left(\frac{-\sqrt{3}}{2}\right)^4 - 6\left(\frac{-\sqrt{3}}{2}\right)^2 = \frac{9}{4} - \frac{9}{2} = \frac{-9}{4}$

  ⇨ MIN en $\left(\frac{-\sqrt{3}}{2}; \frac{-9}{4}\right)$

- $x = 0 \qquad y = 0$

  ⇨ MAX en $(0; 0)$

- $x = \frac{\sqrt{3}}{2} \qquad y = \frac{-9}{4}$

  ⇨ MIN en $\left(\frac{\sqrt{3}}{2}; \frac{-9}{4}\right)$

$$f^{''}(x) = \frac{(2x-4)(x-2)^2 - (x^2-4x).2(x-2)}{((x-2)^2)^2}$$

$$= \frac{2(x-2)(x-2)^2 - (x^2-4x)2(x-2)}{(x-2)^4}$$

$$= \frac{2(x-2)\big((x-2)^2 - (x^2-4x)\big)}{(x-2)^4} = \frac{2(x^2-4x+4-x^2+4x)}{(x-2)^3} = \frac{2.4}{(x-2)^3}$$

$$= \frac{8}{(x-2)^3}$$

Racine : 8 /

$(x-2)^3 = 0 \quad \leftrightarrow x = 2$

x		2	
8	$+$	$+$	$+$
$(x-2)^3$	$-$	0	$+$
$f''(x)$	$-$	$\nexists$	$+$
$f(x)$	$\cap$		$\cup$

Pas de PI