Exp Find y' if $y = \left(\dfrac{x^2}{2x+1}\right)^4$

(Power of Quotient)

مقام بسط

$$y' = 4\left(\frac{x^2}{2x+1}\right)^3 \left[\frac{(2x+1)(2x) - (x^2)(2)}{(2x+1)^2}\right]$$

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

$$= 4 \frac{x^{(2)\boxed{(3)}}}{(2x+1)^{\boxed{3}}} \left[\frac{2x^2 + 2x}{(2x+1)^2}\right]$$

$x^2 x^3 = x^5$

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

$$= \frac{4x^6\, 2x^1(x+1)}{(2x+1)^5}$$

$$= \frac{8x^7(x+1)}{(2x+1)^5}$$

$$y'(1) = \frac{8\boxed{1}^7(\boxed{1}+1)}{(2\boxed{1}+1)^5} = \frac{8(2)}{3^5} = \frac{16}{\underbrace{\underbrace{(3)(3)}_{9}\underbrace{(3)(3)}_{9}}_{81}(3)} = \frac{16}{243}$$

<u>Exp</u> (Quotient of two Powers)

Find y' if $y = \dfrac{\overset{\text{البسط}}{(x^4+3)^3}}{\underset{\text{مقام}}{(x-1)^2}}$. Simplify

$$y' = \frac{\overset{\text{مقام}}{(x-1)^2}\,(3)(x^4+3)^2(4x^3) - \overset{\text{البسط}}{(x^4+3)^3}\,(2)(x-1)(1)}{(x-1)^4}$$

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

$$= \frac{\cancel{(x-1)}\left[12x^3(x-1)(x^4+3)^2 - 2(x^4+3)^3\right]}{(x-1)^{\cancel{4}\,3}}$$

$$= \frac{2(x^4+3)^2\left[6x^3(x-1) - (x^4+3)^1\right]}{(x-1)^3}$$

$(x-1)$

$$= \frac{2(x^4+3)^2\left[6x^4 - 6x^3 - x^4 - 3\right]}{(x-1)^3}$$

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

Exp (Product with Power)

Find $f'(x)$ if $f(x) = (x^2-1)\sqrt{3-x^2}$

$$= \underbrace{(x^2-1)}_{\text{الأول}}\ \underbrace{(3-x^2)^{\frac{1}{2}}}_{\text{الثاني}}$$

الأول

$$f'(x) = (x^2-1)\left(\cancel{\tfrac{1}{2}}\right)(3-x^2)^{\frac{1}{2}-1}(-\cancel{2}x) + (3-x^2)^{\frac{1}{2}}(2x)$$

مشتقة الثاني

الثاني

مشتقة الأول

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

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

$(3-x)$

$$= \frac{-x(x^2-1)}{\sqrt[2]{(3-x^2)^1}} + 2x\sqrt{3-x^2}\,\frac{\sqrt{3-x^2}}{\sqrt{3-x^2}}$$

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

$$= \frac{-x^3 + x + 6x - 2x^3}{\sqrt{3-x^2}}$$

$$= \frac{-3x^3 + 6x}{\sqrt{3-x^2}}$$

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

Exp Find $g'(-2)$ if $g(x) = (x^2+3x)^4\left(5-\frac{x}{2}\right)^3$

Exp Find $g'(-2)$ if $g(x) = (x^2+3x)'(5-\frac{x}{2})'$

ل×١ ثا١

$$g'(x) = (x^2+3x)^4(3)\left(5-\frac{x}{2}\right)^2\left(-\frac{1}{2}\right) + \left(5-\frac{x}{2}\right)^3(4)(x^2+3x)^3(2x+3)$$

ل×١ ثا١ ثا١

$$g'(-2) = \left(\boxed{-2}^2+3\boxed{-2}\right)^4(3)\left(5-\frac{\boxed{-2}}{2}\right)^2\left(-\frac{1}{2}\right) + \left(5-\frac{\boxed{-2}}{2}\right)^3(4)\left(\boxed{-2}^2+3\boxed{-2}\right)^3\left(2\boxed{-2}+3\right)$$

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

$$= (-2)^4(3)(\cancel{36})^{18}\left(\frac{-1}{\cancel{2}}\right) + (216)(4)(-2)^3(\cancel{-1})$$

$$= (16)(3)(18)(-1) + (216)(-4)(-8)$$

$$= -864 + 6912$$

$$= 6048$$