

## Calculs de dérivées

$$1) f(x) = x^5 - 2x^4 + 3x^2 - x + 1$$

$$f'(x) = \underline{5x^4 - 8x^3 + 6x - 1}$$

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

$$f'(x) = \underline{\frac{2}{3}x - \frac{1}{2}}$$

$$3) f(x) = 5x^4 - \frac{1}{3}x^3 + 10x^2 - 1$$

$$f'(x) = \underline{20x^3 - x^2 + 20x}$$

$$4) f(x) = \pi x^6 - \frac{1}{2}x^5 + \sqrt{3}x$$

$$f'(x) = \underline{6\pi x^5 - \frac{5}{2}x^4 + \sqrt{3}}$$

$$5) f(x) = \frac{1}{4x^2 - x - 3}$$

$$f'(x) = \frac{-1 \times (8x - 1)}{(4x^2 - x - 3)^2}$$

$$6) f(x) = \frac{x-1}{x+1}$$

$$f'(x) = \frac{1 \times (x+1) - (x-1) \times 1}{(x+1)^2}$$

$$f'(x) = \frac{-8x+1}{(4x^2-x-3)^2}$$

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

$$7) f(x) = \frac{x^2 - 3x + 1}{x^2 + x + 1}$$

$$8) f(x) = \sqrt{2x+3}$$

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

$$f'(x) = \frac{2}{2\sqrt{2x+3}}$$

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

$$f'(x) = \frac{1}{\sqrt{2x+3}}$$

$$f'(x) = \frac{2x^3 - x^2 - x - 3 - 2x^3 + 5x^2 + x - 1}{(x^2+x+1)^2}$$

$$9) f(x) = \sqrt{x+1}$$

$$f'(x) = \frac{1}{2\sqrt{x}}$$

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

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

$$10) f(x) = \frac{1}{\sqrt{x}} - 3$$

$$f'(x) = \frac{-1 \times \frac{1}{2\sqrt{x}}}{x} = \underline{\underline{-\frac{1}{2x\sqrt{x}}}}$$

$$11) f(x) = \frac{1}{2x}$$

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

$$f'(x) = \frac{-1 \times 2}{4x^2} = \underline{\underline{-\frac{1}{2x^2}}}$$

$$f'(x) = \frac{1 \times 12x^3}{9x^8} = \underline{\underline{\frac{4}{3x^5}}}$$

$$13) f(x) = \frac{1}{x+1}$$

$$14) f(x) = \frac{1}{3x} - 4x^5 + \frac{\sqrt{2}x}{5} - 50$$

$$f'(x) = \frac{-1 \times 1}{(x+1)^2} = \underline{\underline{-\frac{1}{(x+1)^2}}}$$

$$f'(x) = \frac{-1 \times 3}{9x^2} - 5x^4 + \frac{\sqrt{2}}{5}$$

$$15) f(x) = \sqrt{x} - \frac{2x^5}{6}$$

$$f'(x) = \frac{-1}{3x^2} - 5x^4 + \frac{\sqrt{2}}{5}$$

$$f'(x) = \underline{\underline{\frac{1}{2\sqrt{x}} - \frac{5}{6}x^4}}$$

## Calculs de dérivées

$$16) f(x) = \sqrt{x} \left( \frac{x+1}{x-1} \right)$$

$$f'(x) = (\sqrt{x})' \left( \frac{x+1}{x-1} \right) + \sqrt{x} \left( \frac{x+1}{x-1} \right)' = \frac{(x)'}{2\sqrt{x}} \left( \frac{x+1}{x-1} \right) + \sqrt{x} \left[ \frac{(x+1)'(x-1) - (x+1)(x-1)'}{(x-1)^2} \right]$$

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

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

$$f'(x) = \frac{\sqrt{x}(x+1)(x-1)}{2x(x-1)^2} - \frac{2\sqrt{x} \times 2x}{(x-1)^2 2x} = \frac{\sqrt{x} (x^2-1-4x)}{2x(x-1)^2} = \frac{\sqrt{x} (x^2-4x-1)}{2x(x-1)^2}$$

$$17) f(x) = \sqrt{x} (x^2 + 2x - 4)$$

$$f'(x) = (\sqrt{x})' (x^2 + 2x - 4) + \sqrt{x} (x^2 + 2x - 4)'$$

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

$$f'(x) = \frac{\sqrt{x}}{2x} (x^2 + 2x - 4) + \frac{\sqrt{x} (2x + 2) \times 2x}{2x} = \frac{\sqrt{x}}{2x} (x^2 + 2x - 4 + 4x^2 + 4x)$$

$$f'(x) = \frac{\sqrt{x}}{2x} (5x^2 + 6x - 4)$$

$$18) f(x) = \frac{1}{\sqrt{x}} + \frac{1}{2x}$$

$$f'(x) = -\frac{(\sqrt{x})'}{(\sqrt{x})^2} - \frac{(2x)'}{4x^2} = -\frac{(x)'}{2\sqrt{x}} - \frac{2}{4x^2} = -\frac{1}{2\sqrt{x}} - \frac{1}{2x^2} = -\frac{1}{2\sqrt{x}} \times \frac{1}{x} - \frac{1}{2x^2}$$

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

$$19) f(x) = \left( \frac{x-2}{x+3} \right)^2$$

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

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

$$f'(x) = \frac{2(x-2) \times 5}{(x+3)^3} = \frac{10(x-2)}{(x+3)^3}$$

## Calculs de dérivés

$$20) f(x) = \frac{1}{x^2 - 4x + 3} + \sqrt{x}$$

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

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

$$21) f(x) = \frac{x-1}{2} - \frac{2}{x-1}$$

$$f'(x) = \frac{1}{2} - \frac{[(2)'(x-1) - 2(x-1)']}{(x-1)^2} = \frac{1}{2} - \frac{(-2)}{(x-1)^2} = \frac{1}{2} + \frac{2}{(x-1)^2}$$

$$f'(x) = \frac{(x-1)^2 + 4}{2(x-1)^2} = \frac{x^2 - 2x + 1 + 4}{2(x-1)^2} = \frac{x^2 - 2x + 5}{2(x-1)^2}$$

$$22) f(x) = x^2 + 1 - \frac{1}{x^2 + 1}$$

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

$$f'(x) = 2x \frac{(x^2 + 1)^2 + 1}{(x^2 + 1)^2} = \frac{2x(x^4 + 2x^2 + 2)}{(x^2 + 1)^2}$$

$$23) f(x) = 2x + 1 - \frac{2}{3x}$$

$$f'(x) = 2 - \frac{(2)' \cdot 3x - 2(3x)'}{(3x)^2} = 2 + \frac{2 \times 3}{9x^2} = 2 + \frac{2}{3x^2}$$

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

$$24) f(x) = \frac{-3}{\sqrt{x} + 1}$$

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

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

$$25) f(x) = \frac{-7}{(12 - 5x)^2}$$

$$f'(x) = \frac{(-7)'(12 - 5x)^2 - (-7)((12 - 5x)^2)'}{(12 - 5x)^4} = \frac{7 \times 2(12 - 5x)(-5)}{(12 - 5x)^4} = \frac{-70}{(12 - 5x)^3}$$

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$$26) f(x) = \frac{-3}{2\sqrt{5-3x}}$$

$$f'(x) = \frac{(-3)' \cdot 2\sqrt{5-3x} - (-3)(2\sqrt{5-3x})'}{4(5-3x)^2} = \frac{0 \cdot (2\sqrt{5-3x})'}{4(5-3x)^2}$$

$$f'(x) = \frac{3 \cdot \frac{(5-3x)'}{2\sqrt{5-3x}}}{4(5-3x)^2} = \frac{3(-3)}{2\sqrt{5-3x}} \cdot \frac{1}{2(5-3x)} = \frac{-9}{4(5-3x)^{3/2}}$$

$$27) f(x) = 5(3-2x)^{16}$$

$$f'(x) = 5 \times 16(3-2x)^{15} (3-2x)' = 80(3-2x)^{15} \times (-2)$$

$$f'(x) = \underline{-160(3-2x)^{15}}$$

$$28) f(x) = \frac{7}{(2x+1)^6}$$

$$f'(x) = \frac{(7)'(2x+1)^6 - 7((2x+1)^6)'}{(2x+1)^{12}}$$

$$f'(x) = \frac{-7 \times 6(2x+1)^5(2x+1)'}{(2x+1)^{12}} = \frac{-42(2x+1)^5 \times 2}{(2x+1)^{12}}$$

$$f'(x) = \underline{\frac{-84}{(2x+1)^7}}$$

$$29) f(x) = x^5 - 2x^4 + 3x^2 - x + 1$$

$$f'(x) = 5x^4 - 8x^3 + 6x - 1$$

$$f''(x) = 20x^3 - 24x^2 + 6$$

$$f^{(3)}(x) = 60x^2 - 48x$$

$$f^{(4)}(x) = 120x - 48$$

$$f^{(5)}(x) = 120$$

$$f^{(6)}(x) = 0$$

$$30) f(x) = \frac{1}{2x}$$

$$f'(x) = \frac{-2}{4x^2} = -\frac{1}{2x^2}$$

$$f''(x) = \frac{4x'}{4x^4} = \frac{1}{x^3}$$

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

$$f^{(4)}(x) = \frac{3 \times 4x^3}{x^9} = \frac{12}{x^5}$$

$$f^{(5)}(x) = \frac{-12 \times 5x^4}{x^{10}} = -\frac{60}{x^6}$$

$$f^{(6)}(x) = \frac{60 \times 6x^5}{x^{12}} = \frac{360}{x^7}$$

$$31) f(x) = -2x^3$$

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

$$33) f(x) = x^3 + \frac{3}{2}x^2 - 1$$

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

$$35) f(x) = \frac{1}{4}x^4 - \frac{1}{3}x^3$$

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

$$37) f(x) = \frac{-2}{3}x^3 + \frac{3}{2}x^2 + 4x - 1$$

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

$$39) f(x) = 4x^3 + x^2 - 3x + 2$$

$$f'(x) = 12x^2 + 2x - 3$$

$$41) f(x) = (3x^2 - x + 1)^2$$

$$f'(x) = 2(3x^2 - x + 1)(6x - 1)$$

$$42) f(x) = \frac{\sqrt{x}}{x+2}$$

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

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

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

$$44) f(x) = 3x - 4 - \frac{5}{3x-2}$$

$$f'(x) = 3 - \frac{0(3x-1) - 5 \times 3}{(3x-1)^2}$$

$$f'(x) = 3 + \frac{15}{(3x-1)^2}$$

$$46) f(x) = \left(\frac{x-1}{x-1}\right)^2$$

$$f'(x) = 2\left(\frac{x-1}{x-1}\right) \times \frac{(2(x-1) - (x-1))}{(x-1)^2}$$

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

$$32) f(x) = 2x^2 - x + 3$$

$$f'(x) = 4x - 1$$

$$34) f(x) = -x^2 + 3x - 1$$

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

$$36) f(x) = -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 5x - 1$$

$$f'(x) = -x^2 + x + 5$$

$$38) f(x) = \frac{4}{5}x^5 - \frac{3}{2}x^2 - 7x + 2$$

$$f'(x) = 4x^4 - 3x - 7$$

$$40) f(x) = \frac{x-3}{x-x}$$

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

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

$$43) f(x) = \frac{x-1}{3} + \frac{3}{2x-2}$$

$$f'(x) = \frac{2}{3} + \frac{0(2x-1) - 3 \times 2}{(2x-1)^2}$$

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

$$45) f(x) = \frac{-3x^2 + 5x + 2}{x^2 + 3x + 2}$$

$$f'(x) = \frac{(-6x+5)(x^2+3x+2) - (-3x^2+5x+2)(2x+3)}{(x^2+3x+2)^2}$$

$$f'(x) = \frac{-14x^2 - 16x + 4}{(x^2+3x+2)^2}$$

$$47) f(x) = \frac{1}{\sqrt{x}} - \frac{1}{\sqrt{2x}}$$

$$f'(x) = \frac{-\frac{1}{2\sqrt{x}}}{x} + \frac{\frac{2}{2\sqrt{2x}}}{2x}$$

$$f'(x) = \frac{-1}{2\sqrt{x}x} + \frac{1}{\sqrt{2x}2x}$$

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