1 次の関数を微分せよ。

(1) $y=2x^5+3x^4-5x^2+1$ 　　(2) $y=-3x^7+5x^3-4x$

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

(1) $y'=2\cdot 5x^4+3\cdot 4x^3-5\cdot 2x$

$y'=10x^4+12x^3-10x$

(2) $y'=-3\cdot 7x^6+5\cdot 3x^2-4$

$y'=-21x^6+15x^2-4$

(3) $y'=2x\cdot(x^2-x-3)+(x^2+1)(2x-1)$

$=2x^3-2x^2-6x+2x^3-x^2+2x-1$

$=4x^3-3x^2-4x-1$

(4) $y'=(3x^2+1)(x^2-2)+(x^3+x)\cdot(2x)$

$=3x^4-6x^2+x^2-2+2x^4+2x^2$

$=5x^4-3x^2-2$

2 次の関数を微分せよ。

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

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

$=2(x-2)(x-3)^3+(x-2)^2\cdot 3(x-3)^2$

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

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

$=(x-2)(x-3)^2(5x-12)$

(2) $y'=(x+2)'(x-1)(x-5)+(x+2)\{(x-1)(x-5)\}'$

$=(x-1)(x-5)+(x+2)\times$

$\{(x-1)'(x-5)+(x-1)(x-5)'\}$

$=(x-1)(x-5)+(x+2)\{(x-5)+(x-1)\}$

$=x^2-6x+5+(x+2)(2x-6)$

$=3x^2-8x-7$

3 次の関数を微分せよ。

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

(4) $y=\dfrac{x^2-3x+2}{2x-3}$

(1) $y'=-\dfrac{(3x-1)'}{(3x-1)^2}=-\dfrac{3}{(3x-1)^2}$

(2) $y'=\dfrac{x'(x^2+1)-x(x^2+1)'}{(x^2+1)^2}=\dfrac{x^2+1-x\cdot 2x}{(x^2+1)^2}$

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

(3) $y'=\dfrac{1\cdot(x^2+x+1)-(x-2)(2x+1)}{(x^2+x+1)^2}$

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

(4) $y'=\dfrac{(2x-3)(2x-3)-(x^2-3x+2)\cdot 2}{(2x-3)^2}$

$=\dfrac{4x^2-12x+9-2x^2+6x-4}{(2x-3)^2}=\dfrac{2x^2-6x+5}{(2x-3)^2}$

4 次の関数を微分せよ。

(1) $y = \dfrac{1}{x+1}$

(2) $y = \dfrac{2x}{x+3}$

(3) $y = \dfrac{1}{x^2-1}$

(4) $y = \dfrac{x-1}{x^2+1}$

(5) $y = \dfrac{x}{x^2-x+1}$

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

(1) $y' = -\dfrac{1}{(x+1)^2}$

(2) $y' = \dfrac{2(x+3)-2x\cdot 1}{(x+3)^2} = \dfrac{6}{(x+3)^2}$

(3) $y' = -\dfrac{2x}{(x^2-1)^2}$

(4) $y' = \dfrac{1\cdot(x^2+1)-(x-1)\cdot 2x}{(x^2+1)^2} = \dfrac{-x^2+2x+1}{(x+1)^2}$

(5) $y' = \dfrac{1\cdot(x^2-x+1)-x(2x-1)}{(x^2-x+1)^2}$

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

(6) $y' = \dfrac{(3x^2-4)(x-2)-(x^3-4x+1)\cdot 1}{(x-2)^2}$

$= \dfrac{2x^3-6x^2+7}{(x-2)^2}$

5 次の関数を微分せよ。

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

(2) $y = (x^2+3x)(x^2-2)$

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

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

(5) $y = \dfrac{1}{x^4}$

(6) $y = \dfrac{x^2+3x-2}{x}$

(7) $y = \dfrac{x-2}{x^2}$

(8) $y = \dfrac{1}{x^2-3x+2}$

(9) $y = \dfrac{x+1}{x-1}$

(10) $y = \dfrac{x^2+2x-2}{x^2+1}$

(1) $y' = 8x^3+9x^2+8x$

(2) $y' = (2x+3)(x^2-2)+(x^2+3x)\cdot 2x$

$= 2x^3-4x+3x^2-6+2x^3+6x^2$

$= 4x^3+9x^2-4x-6$

(3) $y' = (2x-2)(x^2+4)+(x^2-2x-3)\times 2x$

$= 2x^3+8x-2x^2-8+2x^3-4x^2-6x$

$= 4x^3-6x^2+2x-8$

(4) $y' = 1\cdot(x+2)(x-3)+(x-1)\{1\cdot(x-3)+(x+2)\cdot 1\}$

$= x^2-x-6+(x-1)(2x-1)$

$= x^2-x-6+2x^2-3x+1 = 3x^2-4x-5$

(5) $y' = \dfrac{-4x^3}{(x^4)^2} = -\dfrac{4x^3}{x^8} = -\dfrac{4}{x^5}$

(6) $y = x+3-\dfrac{2}{x}$, $y' = 1-\dfrac{-2}{x^2} = 1+\dfrac{2}{x^2}$

(7) $y' = \dfrac{1\cdot x^2-(x-2)\cdot 2x}{(x^2)^2} = \dfrac{x^2-2x^2+4x}{x^4} = \dfrac{-x^2+4x}{x^4} = \dfrac{-x+4}{x^3}$

(8) $y' = \dfrac{-(2x-3)}{(x^2-3x+2)^2}$

(9) $y' = \dfrac{1\cdot(x-1)-(x+1)\cdot 1}{(x-1)^2} = \dfrac{-2}{(x-1)^2}$

(10) $y' = \dfrac{(2x+2)(x^2+1)-(x^2+2x-2)\cdot 2x}{(x^2+1)^2}$

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