

① $f(x) = 15x^5$

$f'(x) = 15 \cdot \frac{d}{dx}(x^5)$

$f'(x) = 15 \cdot 5x^4 = \boxed{75x^4}$

③ $f(x) = 25x^2$

$f'(x) = 25 \cdot \frac{d}{dx}(x^2) = 25 \cdot 2x$

$f'(x) = \boxed{50x}$

⑤ $f(x) = x^{27}$

$f'(x) = \frac{d}{dx}(x^{27}) = \boxed{27x^{26}}$

⑦ $f(x) = 25x^{e+1}$

$f'(x) = 25 \cdot \frac{d}{dx}(x^{e+1})$

$f'(x) = 25 \cdot e+1 x^e$

$f'(x) = \boxed{(25e+25)x^e}$

Practice Problems ② $f(x) = 12x$

• Find the derivative.

$f'(x) = 12 \cdot \frac{d}{dx}(x)$

$f'(x) = 12 \cdot 1 = \boxed{12}$

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

$f'(x) = \frac{d}{dx}(x^{-2\pi}) = -2\pi x^{-3\pi}$

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

⑥ $f(x) = 12\sqrt{x^3}$

$f'(x) = 12 \cdot \frac{d}{dx}(x^{3/2})$

$f'(x) = 12 \cdot \frac{3}{2} x^{1/2} = \boxed{18\sqrt{x}}$

⑧ $f(x) = x^{\frac{25}{2}}$

$f'(x) = \frac{d}{dx}(x^{25/2})$

$f'(x) = \frac{25}{2} x^{23/2} = \boxed{\frac{25\sqrt{x^{23}}}{2}}$

$$(9) f(x) = 59x$$

$$f'(x) = 59 \frac{d}{dx}(x)$$

$$f'(x) = 59 \cdot 1 = \boxed{59}$$

$$(10) f(x) = 5$$

$$f'(x) = \frac{d}{dx}(5) = \boxed{0}$$

Practice #2

$$(1) f(x) = 15x^5 + 2x^2 + \sqrt[3]{x}$$

$$f'(x) = 15 \cdot \frac{d}{dx}(x^5) + 2 \cdot \frac{d}{dx}(x^2) + \frac{d}{dx}(x^{1/3})$$

$$f'(x) = 15 \cdot 5x^4 + 2 \cdot 2x + \frac{1}{3}x^{-2/3}$$

$$f'(x) = \boxed{75x^4 + 4x + \frac{1}{3\sqrt[3]{x^2}}}$$

$$(2) f(x) = 30x^3 + 59x$$

$$f'(x) = 30 \cdot \frac{d}{dx}(x^3) + 59 \cdot \frac{d}{dx}(x)$$

$$f'(x) = 30 \cdot 3x^2 + 59 \cdot 1$$

$$f'(x) = \boxed{90x^2 + 59}$$

$$(3) f(x) = x^{27} + \sqrt{x} + 1234$$

$$f'(x) = 27x^{26} + \frac{1}{2}x^{-1/2} + 0$$

$$f'(x) = \boxed{27x^{26} + \frac{1}{2\sqrt{x}}}$$

$$(4) f(x) = x^{25} + 15x^3 + x^2 + \pi$$

$$f'(x) = 25x^{24} + 15 \cdot 3x^2 + 2x + 0$$

$$f'(x) = \boxed{25x^{24} + 45x^2 + 2x}$$

$$(5) f(x) = 12x + 2 \quad @ \quad x = 3$$

$$f'(x) = 12 + 0$$

$$f'(x) = 12$$

$$f'(3) = \boxed{12}$$

$$(6) f(x) = 15x^3 + 128 \quad @ \quad x = 1$$

$$f'(x) = 15 \cdot 3x^2 + 0$$

$$f'(x) = 45x^2$$

$$f'(1) = 45(1)^2 = \boxed{45}$$

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

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

[Practice #3] ② $f(x) = x^3\sqrt[3]{x}$
 $f'(x) = \frac{d}{dx}(x^3)\sqrt[3]{x} + (x^3)\frac{d}{dx}(\sqrt[3]{x})$

$f'(x) = 3x^2 \cdot \sqrt[3]{x} + (x^3)\frac{1}{3}x^{-2/3}$
 $f'(x) = \boxed{3x^2\sqrt[3]{x} + \frac{x^3}{3\sqrt[3]{x^2}}}$

③ $f(x) = (12x^3+3)(15x+5)$
 $f'(x) = \frac{d}{dx}(12x^3+3)(15x+5) + (12x^3+3)\frac{d}{dx}(15x+5)$

$f'(x) = (36x^2)(15x+5) + (12x^3+3)(15)$
 $f'(x) = 540x^3 + 180x^2 + 180x^3 + 45$
 $f'(x) = \boxed{720x^3 + 180x^2 + 45}$

④ $f(x) = 12x\sqrt{x}$
 $f'(x) = 12\sqrt{x} + 12x\left(\frac{1}{2\sqrt{x}}\right)$

$f'(x) = \boxed{12\sqrt{x} + \frac{12x}{2\sqrt{x}}}$

⑤ $f(x) = \frac{25x^4}{2x+1}$
 $f'(x) = \frac{\frac{d}{dx}(25x^4)(2x+1) - (25x^4)\frac{d}{dx}(2x+1)}{(2x+1)^2}$

$f'(x) = \frac{(100x^3)(2x+1) - (25x^4)(2)}{(2x+1)^2}$

$f'(x) = \frac{200x^4 + 100x^3 - 50x^4}{(2x+1)^2}$

$f'(x) = \boxed{\frac{150x^4 + 100x^3}{(2x+1)^2}}$

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

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

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

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

$$7) f(x) = \frac{2x^5 + 1}{12x}$$

$$f'(x) = \frac{\frac{d}{dx}(2x^5 + 1)(12x) - (2x^5 + 1)\frac{d}{dx}(12x)}{(12x)^2}$$

$$f'(x) = \frac{(10x^4)(12x) - (2x^5 + 1)(12)}{144x^2}$$

$$f'(x) = \frac{120x^5 - 24x^5 - 12}{144x^2}$$

$$f'(x) = \frac{96x^5 - 12}{144x^2}$$

$$8) f(x) = \frac{15x + 2}{\sqrt{x}}$$

$$f'(x) = \frac{\frac{d}{dx}(15x + 2)(\sqrt{x}) - (15x + 2)\frac{d}{dx}(\sqrt{x})}{(\sqrt{x})^2}$$

$$f'(x) = \frac{(15)(\sqrt{x}) - (15x + 2)\left(\frac{1}{2\sqrt{x}}\right)}{x}$$

$$f'(x) = \frac{15\sqrt{x} - \left(\frac{15x}{2\sqrt{x}} + \frac{2}{2\sqrt{x}}\right)}{x}$$

$$f'(x) = \frac{15\sqrt{x} - \frac{15x}{2\sqrt{x}} - \frac{2}{2\sqrt{x}}}{x}$$