

Calculus Review Sec. 4.1 - 4.2

Name

key

Find the derivative.

① $f(x) = x - x^5$
 $f'(x) = 1 - 5x^4$

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

③ $f(x) = (3x^2 - 8x)(x^2 + 2)$
 $f'(x) = (6x - 8)(x^2 + 2) + (3x^2 - 8x)(2x)$
 $= 6x^3 - 8x^2 + 12x - 16 + 6x^3 - 16x^2$
 $f'(x) = \boxed{12x^3 - 24x^2 + 12x - 16}$

④ $y = x^2(x + 5 + \frac{1}{x}) = x^2(x + 5 + x^{-1})$
 $\frac{dy}{dx} = 2x(x + 5 + x^{-1}) + x^2(1 - x^{-2})$
 $= 2x^2 + 10x + 2 + x^2 - 1$
 $\frac{dy}{dx} = \boxed{3x^2 + 10x + 1}$

⑤ $y = (1 + \sqrt{x})(x + \sqrt{x}) = (1 + x^{1/2})(x + x^{1/2})$
 $\frac{dy}{dx} = (\frac{1}{2}x^{-1/2})(x + x^{1/2}) + (1 + x^{1/2})(1 + \frac{1}{2}x^{-1/2})$
 $= \frac{1}{2}x^{1/2} + \frac{1}{2} + 1 + x^{1/2} + \frac{1}{2}x^{1/2} + \frac{1}{2}$
 $= \boxed{\frac{3\sqrt{x}}{2} + 2 + \frac{1}{2\sqrt{x}}}$

⑥ $f(x) = (x^2 - \frac{3}{x^2})^2 = (x^2 - 3x^{-2})(x^2 - 3x^{-2})$
 $f'(x) = (2x + 6x^{-3})(x^2 - 3x^{-2}) + (x^2 - 3x^{-2})(2x + 6x^{-3})$
 $= 2x^3 - 6x^{-1} + 6x^{-1} - 18x^{-5} + 2x^3 - 6x^{-1} + 6x^{-1} - 18x^{-5}$
 $4x^3 - 36x^{-5} = \boxed{4x^3 - \frac{36}{x^5}}$

⑦ $f(x) = \frac{x+2}{x-2}$
 $f'(x) = \frac{1(x-2) - (x+2)(1)}{(x-2)^2}$
 $= \frac{x-2-x-2}{(x-2)^2} = \boxed{\frac{-4}{(x-2)^2}}$

⑧ $y = (2x-7)^{-1}(x+5) = \frac{x+5}{2x-7}$
 $\frac{dy}{dx} = \frac{1(2x-7) - (x+5)(2)}{(2x-7)^2} = \frac{2x-7-2x-10}{(2x-7)^2}$
 $\frac{dy}{dx} = \boxed{\frac{-17}{(2x-7)^2}}$

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

⑩ $y = \frac{1+x-4\sqrt{x}}{x} = x^{-1} + 1 - 4x^{-1/2}$
 $\frac{dy}{dx} = -x^{-2} + 2x^{-3/2}$
 $= \boxed{-\frac{1}{x^2} + \frac{2}{\sqrt{x^3}}}$

$\frac{\frac{5}{3\sqrt{x^2}} - \frac{4\sqrt[3]{x^4}}{3}}{(x^2+5)^2}$ or $\frac{5-4x^2}{3\sqrt{x^2}(x^2+5)^2}$