

1. จงหา $(y+2)\ln x = e^{xy} + 1$
 $\left. \frac{dy}{dx} \right|_{y=0} = ?$

2. $\lim_{x \rightarrow 1} \frac{3x^2 - 4x + 1}{x^2 - 1}$

3. $\lim_{x \rightarrow -3^-} \frac{|x+1| - 2}{x+3}$

4. $\lim_{x \rightarrow 4} \frac{3 - \sqrt{7 + \sqrt{x}}}{2x^2 - 7x - 4}$

5. $\lim_{x \rightarrow 3^-} \frac{x^2 - 11}{3x^2 - 10x + 3}$

6. $\lim_{x \rightarrow -\infty} \frac{x + 5\sin x}{3x - 8}$

7. $\lim_{x \rightarrow 0} \frac{2\sin x}{4x + 5\sin x}$

8. $f(x) = \begin{cases} 3x^4 - 2 & ; x < 1 \\ 1 & ; x = 1 \\ \frac{2}{x+1} & ; x > 1 \end{cases}$ ต่อเนื่องที่ $x = 1$ หรือไม่ เพราะเหตุใด

$y = u^3 + 5u, u = \sqrt{x} + \frac{1}{x^2}$

9. Find $\left. \frac{dy}{dx} \right|_{x=1}$ Use chain rule

10. $\lim_{x \rightarrow 0} \frac{x \sin 3x}{1 - \cos 4x}$

11. $f(x) = \begin{cases} \frac{1}{x} & ; x < -1 \\ -1 & ; x = -1 \\ \frac{x^2 - 3}{2} & ; x > -1 \end{cases}$ f มีอนุพันธ์ที่ $x = 1$ หรือไม่ โดยบทนิยาม

12. $f(x) = (5x+3)^{-2}$ จงหา $f'(x), f''(x), f'''(x), \dots, f^{(n)}(x)$

13. $f(x) = \sqrt{2^x + 3\arctan(2x)}$ จงหา $f'(0)$

14. $\frac{d}{dx}(x^2 \log(x) + e^\pi) = \dots$

15. $\int_{-2}^1 \frac{|2x^2 - x - 3|}{3 - 2x} dx = \dots$

16. $F(x) = 2^x \int_x^{2-x^4} f(t) dt, f(1) = -3$ Find $F'(1)$

17. $\int \frac{e^{2x} + e^x}{(2e^x + 3)^2} dx = \dots$

18. $\int \frac{\sin(x) + x \cos(x)}{\sqrt{4 - x^2} \sin^2(x)} dx$

19. $\int_{\frac{\pi^2}{16}}^{\frac{\pi^2}{9}} \frac{\tan^3(\sqrt{x})}{\sqrt{x} \sec(\sqrt{x})} dx$

$$2 \quad \lim_{x \rightarrow 1} \frac{3 \cdot x^2 - 4 \cdot x + 1}{x^2 - 1} \rightarrow 1$$

$$3 \quad \lim_{x \rightarrow -3} \frac{|x+1| - 2}{x+3} \rightarrow -1$$

$$4 \quad \lim_{x \rightarrow 4} \frac{3 - \sqrt{7 + \sqrt{x}}}{2 \cdot x^2 - 7 \cdot x - 4} \rightarrow \frac{-1}{216}$$

$$(3 - \sqrt{7 + \sqrt{x}}) \cdot (3 + \sqrt{7 + \sqrt{x}}) \text{ expand} \rightarrow 2 - x^{\frac{1}{2}}$$

$$2 \cdot x^2 - 7 \cdot x - 4 \text{ factor} \rightarrow (2 \cdot x + 1) \cdot (x - 4)$$

$$5 \quad \lim_{x \rightarrow 3} \frac{x^2 - 11}{3 \cdot x^2 - 10 \cdot x + 3} \rightarrow \infty$$

$$6 \quad \lim_{x \rightarrow \infty} \frac{x + 5 \cdot \sin(x)}{3 \cdot x - 8} \rightarrow \frac{1}{3}$$

$$10 \quad \lim_{x \rightarrow 0} \frac{2 \cdot \sin(x)}{4 \cdot x + 5 \cdot \sin(x)} \rightarrow \frac{2}{9}$$

$$\lim_{x \rightarrow 0} \frac{x \cdot \sin(3 \cdot x)}{1 - \cos(4 \cdot x)} \rightarrow \frac{3}{8}$$

$$12 \quad f(x) := \frac{1}{(5 \cdot x + 3)^2}$$

$$\frac{d}{dx} f(x) \text{ factor} \rightarrow \frac{-10}{(5 \cdot x + 3)^3}$$

$$\frac{d^2}{dx^2} f(x) \text{ factor} \rightarrow \frac{150}{(5 \cdot x + 3)^4}$$

$$\frac{d^3}{dx^3} f(x) \text{ factor} \rightarrow \frac{-3000}{(5 \cdot x + 3)^5}$$

$$13 \quad f(x) := \sqrt{2^x + 3 \cdot \operatorname{atan}(2 \cdot x)}$$

$$\frac{d}{dx} f(x) \text{ expand} \rightarrow \frac{1}{1} \cdot 2^x \cdot \ln(2) + \frac{3}{2 \cdot (2^x + 3 \cdot \operatorname{atan}(2 \cdot x))^2} \cdot (2^x + 3 \cdot \operatorname{atan}(2 \cdot x))^2 \cdot (1 + 4 \cdot x^2)$$

$$f'(x) := \frac{d}{dx} f(x) \text{ factor} \rightarrow \frac{1}{2} \cdot \frac{(2^x \cdot \ln(2) + 4 \cdot 2^x \cdot \ln(2) \cdot x^2 + 6)}{(2^x + 3 \cdot \operatorname{atan}(2 \cdot x))^2 \cdot (1 + 4 \cdot x^2)}$$

$$f'(0) \rightarrow \frac{1}{2} \cdot \ln(2) + 3 = 3.347$$

$$14 \quad \frac{d}{dx} (x^2 \cdot \log(x) + e^{\pi}) \rightarrow 2 \cdot x \cdot \frac{\ln(x)}{\ln(10)} + \frac{x}{\ln(10)}$$

$$15 \quad \int_{-2}^1 \frac{|2 \cdot x^2 - x - 3|}{3 - 2 \cdot x} dx \rightarrow \frac{5}{2}$$

$$17 \quad \int \frac{e^{2 \cdot x} + e^x}{(2 \cdot e^x + 3)^2} dx \rightarrow \frac{1}{4 \cdot (2 \cdot \exp(x) + 3)} + \frac{1}{4} \cdot \ln(2 \cdot \exp(x) + 3)$$

$$19 \quad \int \frac{\tan(\sqrt{x})^3}{\sqrt{x} \cdot \sec(\sqrt{x})} dx \rightarrow 2 \cdot \frac{\sin\left(\frac{1}{x^2}\right)^4}{\cos\left(\frac{1}{x^2}\right)} + 2 \cdot \sin\left(\frac{1}{x^2}\right)^2 \cdot \cos\left(\frac{1}{x^2}\right) + 4 \cdot \cos\left(\frac{1}{x^2}\right)$$