

Optional Extra Differentiation Practice

1. $\lim_{t \rightarrow 0} \frac{e^{\tan(x+t)} - e^{\tan x}}{t} =$

2. $\lim_{h \rightarrow 0} \frac{\cos(x+h)^2 - \cos x^2}{h} =$

3. $\lim_{x \rightarrow \frac{\pi}{3}} \frac{\sec x - 2}{x - \frac{\pi}{3}} =$

4. $\lim_{x \rightarrow 27} \frac{\log_3(\sqrt[3]{x}) - 1}{x - 27} =$

Directions: find the derivatives of the following functions, where a , b , and k are constants. Sometimes simplification prior to differentiation will make the work easier.

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

6. $y = \frac{3t^5 - t^2 + 6}{\sqrt{t}}$

7. $f(x) = \tan^4(8x^3)$

8. $f(x) = \frac{1}{2\sin x \cos x}$

9. $f(x) = 2^{-x}$

$$10. f(x) = e^{\sin 3x}$$

$$11. f(x) = \cos(\arctan \pi x)$$

$$12. f(x) = e^{3x}(x^2 + 7^x)$$

$$13. f(x) = \ln(\sec(x^3))$$

$$14. f(x) = \ln\left(\frac{e^{kx}}{b}\right)$$

$$15. f(x) = \log_5(\tan x)$$

$$16. f(x) = \frac{1}{8} \log_2(\csc x)$$

$$17. f(x) = x^{a \cot x}$$

$$18. y = \frac{e^t - e^{-t}}{e^t + e^{-t}}$$