

HOMEWORK 5

Instructions: Compute the following functions. You may not use a calculator except where explicitly stated. You are encouraged to use the power, product, quotient, and chain rule, together with the derivatives of exponential and trig functions we know, to solve these problems. My advice is to use the power rule (or exponential or trigonometric rules) for problems 1-25, the product or quotient rule for problems 26-36, and the chain rule for problems 37-48. Problems 49-54 I'll leave to your discretion.

$$(1) \frac{d}{dx} [x + \sqrt{x}]$$

$$(2) \frac{d}{dx} [x^4]$$

$$(3) \frac{d}{dx} [\sin(x) + \cos(x)]$$

$$(4) \frac{d}{dx} [x^2 + \frac{1}{x}]$$

$$(5) \frac{d}{dx} [\sqrt[5]{x} + \frac{1}{\sqrt[3]{x}}]$$

$$(6) \frac{d}{dx} [2x^2 + 5x - 1]$$

$$(7) \frac{d}{dx} [x^{1000} - 1]$$

$$(8) \frac{d}{dx} [x\sqrt{x}]$$

$$(9) \frac{d}{dx} \left[\frac{x^2+1}{x} \right]$$

$$(10) \frac{d}{dx} [x^5 + x^4 + x^3 + x^2 + x + 1]$$

$$(11) \frac{d}{dx} [(x+1)(x^2+3)]$$

$$(12) \frac{d}{dx} [x^7 - 3x^4 + 2x]$$

$$(13) \frac{d}{dx} \left[\frac{1}{x} - \frac{1}{x^2} \right]$$

$$(14) \frac{d}{dx} \left[x - \frac{1}{x} \right]$$

$$(15) \frac{d}{dx} [x^{100} - 5x^{20} + 100x]$$

$$(16) \frac{d}{dx} \left[\frac{1}{x^5} + \sqrt{x} + 3 \right]$$

$$(17) \frac{d}{dx} [e^x - x^2]$$

$$(18) \frac{d}{dx} [\sin(x) + \tan(x) + 5^x]$$

$$(19) \frac{d}{dx} [e^x + \sqrt{x} - \sec(x)]$$

$$(20) \frac{d}{dx} [2^x]$$

$$(21) \frac{d}{dx} \left[3^x - e^x + \frac{1}{x} \right]$$

$$(22) \frac{d}{dx} [1^x + 2^x + 3^x + e^x]$$

$$(23) \frac{d}{dx} [-\cos(x)]$$

$$(24) \frac{d}{dx} \left[\sec(x) + x^2 - \sqrt[3]{x^2} \right]$$

$$(25) \frac{d}{dx} [(2x)^3]$$

$$(26) \frac{d}{dx} [xe^x]$$

$$(27) \frac{d}{dx} \left[x^2 e^x + \frac{e^x}{x} \right]$$

$$(28) \frac{d}{dx} \left[\frac{x}{x+1} \right]$$

$$(29) \frac{d}{dx} \left[\frac{3+x}{1-3x} \right]$$

$$(30) \frac{d}{dx} \left[\frac{2x+5}{-x+2} \right]$$

$$(31) \frac{d}{dx} \left[\frac{e^x}{\sin(x)} \right]$$

$$(32) \frac{d}{dx} [e^x \tan(x)]$$

$$(33) \frac{d}{dx} [(x+1)(e^x+3)]$$

$$(34) \frac{d}{dx} [\sqrt{x}(\sin(x)+x)]$$

$$(35) \frac{d}{dx} \left[\frac{\sin(x)+\cos(x)}{\sin(x)-\cos(x)} \right]$$

$$(36) \frac{d}{dx} \left[\frac{2^x}{x^3+x^2+x-\sqrt{x}} \right]$$

$$(37) \frac{d}{dx} [\sqrt{1+2x}]$$

$$(38) \frac{d}{dx} [\sin(\cos(x))]$$

$$(39) \frac{d}{dx} [e^{e^x}]$$

$$(40) \frac{d}{dx} [2^{\sin(x)}]$$

$$(41) \frac{d}{dx} [\sin(3x)]$$

$$(42) \frac{d}{dx} [e^{x^2}]$$

$$(43) \frac{d}{dx} [\tan(e^x)]$$

$$(44) \frac{d}{dx} [\sqrt[3]{\sin(x)}]$$

$$(45) \frac{d}{dx} [(x^2 + 1)^4]$$

$$(46) \frac{d}{dx} [e^{3x^3+1}]$$

$$(47) \frac{d}{dx} [e^{\sqrt{x^2+x}}]$$

$$(48) \frac{d}{dx} [\sqrt{\sin(3x)}]$$

$$(49) \frac{d}{dx} [\sqrt{x + \sqrt{x + \sqrt{x}}}]$$

$$(50) \frac{d}{dx} \left[\frac{x^3 + \sqrt{x}}{x} \right]$$

$$(51) \frac{d}{dx} [(x + 1)(x^2 + 3)^4]$$

$$(52) \frac{d}{dx} [\sqrt{e^x}]$$

$$(53) \frac{d}{dx} [\sin^2(x) + \cos^2(x)]$$

$$(54) \frac{d}{dx} \left[\frac{\sin(x)}{\cos(x)} \right]$$