Review: Derivative Rules - 10/21/16

1 Basic Rules

1. $\frac{d}{dx}[f(x)+g(x)] = \frac{d}{dx}f(x) + \frac{d}{dx}g(x)$
2. $\frac{d}{dx}[f(x)-g(x)] = \frac{d}{dx}f(x) - \frac{d}{dx}g(x)$
3. $\frac{d}{dx}[cf(x)] = c\frac{d}{dx}f(x)$
4. $\frac{d}{dx}c = 0$

2 Power Rule

Power Rule: $\frac{d}{dx}x^n = nx^{n-1}$.

Example 2.0.1 *What is $\frac{d}{dx}x^2-3x+1$? We can separate each term using the addition rule constant multiple rule to get $\frac{d}{dx}x^2 - 3x + 1 = \frac{d}{dx}x^2 - 3\frac{d}{dx}x + \frac{d}{dx}1$. Then using the power rule (and the fact that the derivative of a constant is zero), we get $\frac{d}{dx}x^2 - 3x + 1 = 2x - 3$.*

Example 2.0.2 *What is $\frac{d}{dx}\frac{1}{x} + \pi^3$? We can separate these out using the addition rule to get $\frac{d}{dx}\frac{1}{x} + \frac{d}{dx}\pi^3$. But π^3 is just a constant, so $\frac{d}{dx}\pi^3 = 0$! Then we just have to apply the product rule to $\frac{1}{x}$ to get that $\frac{d}{dx}\frac{1}{x} = -1x^{-1-1} = -x^{-2} = \frac{-1}{x^2}$.*

3 e^x

Rule for e^x: $\frac{d}{dx}e^x = e^x$.

Example 3.0.3 *What is $\frac{d}{dx}7e^x$? By the constant multiple rule, we have $\frac{d}{dx}7e^x = 7\frac{d}{dx}e^x = 7e^x$.*

Example 3.0.4 *What is $\frac{d}{dx}3x^{100} - \pi e^x$? Using the constant multiple rule and the power rule, we have $3\frac{d}{dx}x^{100} - \pi\frac{d}{dx}e^x = 3(100)x^{100-1} - \pi e^x = 300x^{99} - \pi e^x$.*

Practice Problems

1. What is $\frac{d}{dx}x^5 - x^2 + 3$?
2. What is $\frac{d}{dx}x - e^7$?
3. What is $\frac{d}{dx}x^4 + 3e^x$?
4. What is $\frac{d}{dx}17e^x - 2400$?

Solutions

1. $5x^4 - 2x$
2. 1
3. $4x^3 + 3e^x$
4. $17e^x$