

# In-class Activity 5

**Question 1** Write the derivatives for the following elementary functions:

- $\frac{d}{dx}c =$

- $\frac{d}{dx}\cos(x) =$

- $\frac{d}{dx}x^n =$

- $\frac{d}{dx}e^x =$

- $\frac{d}{dx}\sin(x) =$

- $\frac{d}{dx}\ln(x) =$

**Question 2** Given below are two functions  $f(x)$  and  $g(x)$ , and a constant  $c$ . Complete the following differentiation formulas:

- $(f(x) + g(x))' =$

- $(f(x) - g(x))' =$

- $(cf(x))' =$

Now use them to compute the derivatives of the following functions:

- $(3x^4 - 2x + 1)' =$

- $\left(\frac{3}{x^3} + \sqrt{x} + \ln(x)\right)' =$

- $(\cos(x) - 5\sin(x) + \sqrt{2}e^x)' =$

- $\left(\frac{x^5 - x}{x^2}\right)' =$

**Question 3**

Write the formula for the **PRODUCT RULE**:

$$(f(x)g(x))' =$$

Now use it to compute the following derivatives:

$$\bullet (x^6 \cos(x))' =$$

$$\bullet ((3x^2 + 1)(5x^3 - x^2 + x - 2))' =$$

$$\bullet ((\sqrt[3]{x} - 1)e^x)' =$$

**Question 4**

Write the formula for the **QUOTIENT RULE**:

$$\left(\frac{f(x)}{g(x)}\right)' =$$

Now use it to compute the following derivatives:

$$\bullet \left(\frac{x^6 - 3x + 1}{x^3 - 2}\right)' =$$

$$\bullet \left(\frac{\sin(x) + 4 \ln(x)}{e^x + x^3}\right)' =$$

$$\bullet (\tan(x))' =$$

**Question 5**

Use all the rules learned so far to find the following derivatives:

- $(x \cos(x) \ln(x))' =$

- $\left(\frac{x^2 + 1}{e^x(5x - 1)}\right)' =$

- $(x \cot(x))' =$

**Question 6**

Find the equation of the tangent line to the graph of the function  $f(x) = x \ln(x)$  at the point where  $x = e^4$ .