DATE: ____________

Derivatives of Exponential Functions

1. Find y' for $y = \cos x - 10e^x + 8x$

$\boxed{y' = -\sin x - 10e^x + 8}$

2. Find the second derivative of:

$y = 3e^x$

$\frac{dy}{dx} = 3e^x$

$\boxed{\frac{d^2y}{dx^2} = 3e^x}$

3. Find $f'(x)$ if $f(x) = \dfrac{x^2e^x}{\cos x}$ quotient or product

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

$= \dfrac{2xe^x\cos x + x^2e^x\cos x + x^2e^x\sin x}{\cos^2 x}$

$\boxed{f'(x) = \dfrac{xe^x(2\cos x + x\cos x + x\sin x)}{\cos^2 x}}$

4. Find y' for $y = \dfrac{x^2 + 2x + e^x}{\sin x + 1}$ quotient

$\boxed{y' = \dfrac{(\sin x + 1)(2x + 2 + e^x) - (x^2 + 2x + e^x)(\cos x)}{(\sin x + 1)^2}}$

5. Find $\dfrac{dy}{dt}$ for $y = \dfrac{4e^t + t}{t^3 + 2t + 1}$

$\boxed{\frac{dy}{dx} = \dfrac{(t^3 + 2t + 1)(4e^t + 1) - (4e^t + t)(3t^2 + 2)}{(t^3 + 2t + 1)^2}}$

6. Find $\dfrac{dy}{dx}$ for $y = e^{x^2}$ chain

$\frac{dy}{dx} = e^{x^2} \cdot 2x$

$\boxed{\frac{dy}{dx} = 2xe^{x^2}}$

7. Find $f'(x)$ if $f(x) = xe^{2x}$ product + chain

$f'(x) = e^{2x}(1) + x(e^{2x} \cdot 2)$

$= e^{2x} + 2xe^{2x}$

OR

$\boxed{\frac{dy}{dx} = e^{2x}(1 + 2x)}$

8. Find y' for $y = \sqrt[3]{e^x + 1}$

$y = (e^x + 1)^{1/3}$ chain

$y' = \frac{1}{3}(e^x + 1)^{-2/3}(e^x)$

$\boxed{y' = \frac{1}{3}e^x(e^x + 1)^{-2/3}}$

9. Find $g'(x)$ for $g(x) = \dfrac{e^x - e^{-x}}{2}$ coefficient avoid quotient

$g(x) = \frac{1}{2}e^x - \frac{1}{2}e^{-x}$

$g'(x) = \frac{1}{2}e^x - \frac{1}{2}e^{-x}(-1)$

$\boxed{g'(x) = \frac{1}{2}e^x + \frac{1}{2}e^{-x}}$

10. Find $\dfrac{dy}{dx}$ for $e^x + e^y = x^3$ $\xrightarrow{\text{solve for } e^y}$ $e^y = x^3 - e^x$

$e^x + e^y\frac{dy}{dx} = 3x^2$

$e^y\frac{dy}{dx} = 3x^2 - e^x$

$\frac{dy}{dx} = \dfrac{3x^2 - e^x}{e^y}$

$\boxed{\frac{dy}{dx} = \dfrac{3x^2 - e^x}{x^3 - e^x}}$