Quiz 6

Problem.

1. Find y' if
$$y = \ln(e^{2x+3}) \cdot \cos(e^{2x})$$

2. Solve
$$2^{x-5} = 4$$

Solution.

1. Note that, $\ln(e^{2x+3}) = 2x + 3$. Thus we will need to take the derivative of $y = (2x + 3) \cdot \cos(e^{2x})$. We use the product rule.

$$\frac{dy}{dx} = \frac{d}{dx}\left((2x+3) \cdot \cos(e^{2x})\right) = \frac{d}{dx}(2x+3) \cdot \cos(e^{2x}) + (2x+3) \cdot \frac{d}{dx}\left(\cos(e^{2x})\right)$$

$\frac{d}{dx}(2x + 3) = 2$ simply by the Power Rule. For $\frac{d}{dx}\left(\cos(e^{2x}\right)$ we use the chain rule repeatedly:

$$\begin{aligned}\frac{d}{dx}\left(\cos(e^{2x})\right) &= -\sin(e^{2x}) \cdot \frac{d}{dx}\left(e^{2x}\right) \\ &= -\sin(e^{2x}) \cdot e^{2x} \cdot \frac{d}{dx}(2x) \\ &= \end{aligned}$$

Thus, we have that

$$y' = \frac{dy}{dx} = 2\cos(e^{2x}) - 2e^{2x}(2x+3)\sin(e^{2x})$$

2.

$$\begin{aligned} & 2^{x-5} = 4 \\ \Longrightarrow\ & \log_2(2^{x-5}) = \log_2(4) \\ \Longrightarrow\ & x - 5 = \log_2(4) = \log_2(2^2) = 2 \\ \Longrightarrow\ & x = 7 \end{aligned}$$

Alternatively,

$$\begin{aligned} & 2^{x-5} = 2^2 \\ \Longrightarrow\ & x - 5 = 2 \\ \Longrightarrow\ & x = 7 \end{aligned}$$