Solution of Quiz 6

1 Find all real numbers that satisfy $2^{2-x} = 8^3$.

Solution. The given equation is satisfied if and only if

$$2^{2-x} = (2^3)^3$$

$$2^{2-x} = 2^9$$

$$2 - x = 9$$

$$x = -7$$

Thus, $2^{2-x} = 8^3$ if and only if x = -7.

2 Solve the equation $\ln x = 2(\ln 4 - \ln 3)$.

Solution. The given equation is satisfied if and only if

$$\ln x = 2(\ln 4 - \ln 3)$$
$$\ln x = 2\ln \frac{4}{3}$$
$$\ln x = \ln \left(\frac{4}{3}\right)^2$$
$$x = \frac{16}{9}$$

3 Find the slope of the tangent line to the curve $f(x) = \ln(x^2 + 1)$ at the point where x = 1. Solution. Since the derivative of f(x) is

$$f'(x) = \frac{\frac{d}{dx}(x^2+1)}{x^2+1} = \frac{2x}{x^2+1}$$

the slope of the tangent line at the point where x = 1 is

$$f'(1) = \frac{2(1)}{(1)^2 + 1} = 1.$$