Exponential Reflections

Topic 2: Functions

- Exponentials, Logarithms, and Reflections
- 1. Consider the functions $f(x) = e^{3x-1}$ and $g(x) = \ln \sqrt[3]{x}$.
 - (a) Find $f^{-1}(x)$. (2 marks)

(b) Find
$$g^{-1}(x)$$
. (2 marks)

(c) Show that $g(f(x)) = x - \frac{1}{3}$. (3 marks)

Mark scheme:

(a)
$$x = e^{3y-1}$$
 (M1)

$$3y - 1 = \ln x$$

 $3y = \ln x + 1$ (A1) $y = \frac{1}{3}\ln x + \frac{1}{3}$

(b)
$$x = \ln \sqrt[3]{y}$$
 (M1)

$$e^x = \sqrt[3]{y} \tag{A1}$$

$$y = e^{3x}$$

(C)
$$\ln(e^{3x-1})^{1/3}$$
 (M1)

$$= \frac{1}{3} \ln(e^{3x-1})$$

= $\frac{1}{3}(3x-1)$ (A1)

$$= x - \frac{1}{3}$$
(AG)