

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)

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

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

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

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

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

$$y = e^{3x} \quad (\text{A1})$$

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

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

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

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