INTEGRALS RESULTING IN LOGARITHMIC FUNCTIONS

1 Find the primitive of the following:

(a) $\dfrac{2}{x}$

(b) $\dfrac{1}{x+1}$

(c) $\dfrac{2}{2x+1}$

(d) $\dfrac{x}{x^2-4}$

(e) $\dfrac{1}{2x-1}$

(f) $\dfrac{e^x}{4+e^x}$

(g) $\dfrac{x^3}{x^4+1}$

(h) $\dfrac{e^{2x}}{4-e^{2x}}$

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2 If $\dfrac{dy}{dx} = \dfrac{1}{x}$ and $y = 0$ where $x = 2$, then the correct expression for y in terms of x is:

   A $y = \log_e x - 2$ **B** $y = \dfrac{1}{2}\log_e x$ **C** $y = \log_e\left(\dfrac{x}{2}\right)$ **D** $y = 2\log_e x$

3 The gradient of a curve at any point is $\dfrac{2}{2x+1}$ and the curve passes through the point $(1, \log_e 3)$. Find the equation of the curve.

4 Find the rule that defines $f(x)$ given that $f'(x) = \dfrac{x}{x^2+9}$ and $f(0) = \log_e 3$. Indicate whether each statement below is a correct or incorrect step in the solution of this problem.

  (a) $f(x) = \displaystyle\int \dfrac{x}{x^2+9}\,dx$ **(b)** $f(x) = \dfrac{1}{2}\ln\left(x^2+9\right)+C$ **(c)** $C = 2\ln 3$ **(d)** $f(x) = \dfrac{1}{2}\ln\left(x^2+9\right)$

5 Write the derivative of $\log_e(\cos x)$ and hence find the primitive function of $\tan x$.

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6 Differentiate: **(a)** 2^x **(b)** $x + 10^x$ **(c)** $e^x + 5^x$ **(d)** 5^{x^2} **(e)** $a^{\sqrt{x}}$

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7 Find:

(a) $\displaystyle\int 3^x \, dx$ **(b)** $\displaystyle\int \left(x + 10^x\right) dx$ **(c)** $\displaystyle\int \left(\frac{1}{x} + 1 + e^x + a^x\right) dx$