

1. Evaluate the following logarithms exactly.

+2

$$(a) \log_4\left(\frac{1}{16}\right) = y \quad 4^y = \frac{1}{16}$$

$$y = -2$$

+4

$$(b) \log_5(100) - \log_5(2) - \log_5(10)$$

$$\log_5\left(\frac{100}{2}\right) - \log_5(10)$$

$$\log_5(50) - \log_5(10)$$

$$\log_5\left(\frac{50}{10}\right)$$

$$\log_5(5)$$

$$1$$

+4

2. Write as a single logarithm.

$$\frac{1}{2} \ln(x+2)^2 - \frac{1}{3} \ln(x^2+x-2)^3$$

$$\ln\left[\left((x+2)^2\right)^{1/2}\right] - \ln\left[\left((x^2+x-2)^3\right)^{1/3}\right]$$

$$\ln(x+2) - \ln(x^2+x-2)$$

$$\ln \frac{x+2}{x^2+x-2}$$

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$$\ln \frac{x+2}{(x+2)(x-1)}$$

$$\ln \frac{1}{x-1}$$

- +4 3. An exponential curve of the form  $y = Ca^x$  passes through the points (2, 18) and (3, 54). Find  $C$  and  $a$ .

$$18 = C \cdot a^2 \longrightarrow 18 = C \cdot 3^2$$

$$54 = C \cdot a^3 \qquad 18 = C \cdot 9$$

Divide:  $\frac{54}{18} = \frac{Ca^3}{Ca^2}$   $C = 2$

$$3 = a$$

$$y = 2 \cdot 3^x \quad \left( \begin{array}{l} -1 \\ \text{for } 6^x \end{array} \right)$$

- +4 4. Find the derivative of  $p(x) = e^{x \cos(x)}$ .

$$p'(x) = e^{x \cos(x)} \frac{d}{dx} (x \cos(x))$$

$$= e^{x \cos(x)} \left[ x \frac{d}{dx} \cos(x) + \cos(x) \cdot \frac{d}{dx} x \right]$$

$$= e^{x \cos(x)} \left[ -x \sin(x) + \cos(x) \right]$$

- +4 5. Find the derivative of  $q(x) = \frac{x \leftarrow f(x)}{\ln(x) \leftarrow g(x)}$

$$q'(x) = \frac{g(x) f'(x) - f(x) g'(x)}{g(x)^2}$$

$$= \frac{(\ln x) \cdot 1 - x \cdot \left(\frac{1}{x}\right)}{(\ln(x))^2}$$

$$= \frac{\ln x - 1}{(\ln(x))^2}$$