

# 4.5 HW Solutions - 21, 25, 29, 49, 53, 57, 61, 85, 129

21.) on the website I said you could skip this problem

$$25.) \ln 1.5 = \ln \frac{3}{2} = \ln 3 - \ln 2 \rightarrow \boxed{b-a}$$

given:  $\ln 2 = a$  ;  $\ln 3 = b$

$$29.) \ln \sqrt[5]{6} = \ln 6^{1/5} = \frac{1}{5} \ln 6 = \frac{1}{5} [\ln(2 \cdot 3)] \\ = \frac{1}{5} [\ln 2 + \ln 3] = \boxed{\frac{1}{5}(a+b)}$$

$$49.) \ln \frac{5x\sqrt{1+3x}}{(x-4)^3}, x > 4 \rightarrow \ln \frac{5x(1+3x)^{1/2}}{(x-4)^3} \\ = \ln 5x + \ln(1+3x)^{1/2} - \ln(x-4)^3 = \boxed{\ln 5x + \frac{1}{2} \ln(1+3x) - 3 \ln(x-4)}$$

$$53.) \log_3 \sqrt{x} - \log_3 x^3 \rightarrow \log_3 x^{1/2} - \log_3 x^3 = \log_3 \left( \frac{x^{1/2}}{x^3} \right) \\ = \log_3 x^{(1/2-3)} = \log_3 x^{-5/2} = \boxed{\frac{-5}{2} \log_3 x}$$

$$57.) \ln \left( \frac{x}{x-1} \right) + \ln \left( \frac{x+1}{x} \right) - \ln(x^2-1) \\ \ln \left[ \frac{\left( \frac{x}{x-1} \right) \left( \frac{x+1}{x} \right)}{x^2-1} \right] = \ln \frac{\left( \frac{x+1}{x-1} \right)}{x^2-1} = \ln \frac{\frac{x+1}{x-1}}{(x+1)(x-1)} \\ = \ln \frac{\cancel{x+1}}{x-1} \cdot \frac{1}{(\cancel{x+1})(x-1)} = \ln \frac{1}{(x-1)^2} = \ln(x-1)^{-2} = \boxed{-2 \ln(x-1)}$$

<over>

$$61.) 2 \log_a(5x^3) - \frac{1}{2} \log_a(2x+3)$$

$$= \log_a(5x^3)^2 - \log_a(2x+3)^{1/2} = \boxed{\log_a\left(\frac{25x^6}{\sqrt{2x+3}}\right)}$$

$$85.) \ln(y-3) = -4x + \ln C$$

\* TAKE 'e' to the power on each side

$$e^{\ln(y-3)} = e^{(-4x + \ln C)}$$

$$e^{\ln(y-3)} = e^{-4x} \cdot e^{\ln C} \quad \leftarrow \begin{array}{l} * e \text{ and } \ln \text{ will cancel} \\ * \text{ used a property to get to} \\ \text{here} \end{array}$$

$$y-3 = e^{-4x} \cdot C \rightarrow \boxed{y = Ce^{-4x} + 3}$$

$$129.) M(x) = \log\left(\frac{x}{x_0}\right) \rightarrow \log\left(\frac{\text{seismographic reading}}{\text{zero level earthquake}(10^{-3})}\right)$$

$$M(x) = \log\left(\frac{125,892}{10^{-3}}\right)$$

$$M(x) = \log\left(\frac{125,892}{.001}\right) = \boxed{8.1}$$