

More problems for section 5.2 of *Essentials of Precalculus with Calculus Previews* by Zill and Dewar, 6e.

1. Evaluate each expression. Do not use a calculator.

- | | | |
|--------------------------|---------------------------------------|-----------------------------------------|
| a. $\log_5 125$ | b. $\log_3 \frac{1}{27}$ | c. $\ln \frac{1}{e}$ |
| d. $\log_{10} \sqrt{10}$ | e. $\log_{16} 4$ | f. $\log_{16} 2$ |
| g. $\log_9 \frac{1}{3}$ | h. $\log_2 6 - \log_2 15 + \log_2 20$ | i. $\log_3 100 - \log_3 18 - \log_3 50$ |
| j. $e^{\ln 7}$ | k. $e^{-2 \ln 5}$ | l. $\log_2(\ln e^{2^{10}})$ |

2. Rewrite entirely in terms of logs of linear functions.

- | | | |
|--------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------|
| a. $\ln((x-1)(x+2)^2)$ | b. $\log_2(x^2-9)$ | c. $\log \sqrt{x^2-5x+6}$ |
| d. $\ln(x^2-3)$ | e. $\log \sqrt[3]{(x^2-5x-6)^5}$ | f. $\log_3 \left(x^2 \left(\frac{\sqrt[4]{(2-x)}}{(x+3)} \right)^3 \right)$ |
| g. $\ln \frac{(x-1)^{-1}(3x+1)^2}{(x+1)^{-2}(3x+1)^4}$ | h. $\log \frac{(x-1)(x+4)}{100}$ | i. $\log_\pi \frac{x^2+x-2}{2x^2+3x-20}$ |
| j. $\ln(2x^2+5x-12)$ | k. $\log(3x^2-18x-48)$ | l. $\log((x^2-6x+9)^5)$ |

3. Rewrite as a single logarithm.

- | | |
|----------------------------------|-----------------------------------------------------------------------------|
| a. $\ln(x-3) + 4 \ln(x+1)$ | b. $\log_3(x-1) + \log_3(x+1)$ |
| c. $.5 \log(x-4) + .5 \log(x+3)$ | d. $\ln(2x-1) + \frac{1}{3} \ln(3x+4)$ |
| e. $2 \log(x-3) - 3 \log(4-x)$ | f. $-\ln(2x-1) + 2 \ln(3x+1) - 3 \ln(4x+1)$ |
| g. $3 + \ln(x-1) - 5 \ln(x+4)$ | h. $\ln x - 2 \left(\ln(x+2) - \frac{1}{5} \ln(2x-5) \right) + 4 \ln(x+4)$ |

4. Find the inverse function. State the domain and range of the inverse. (Source: Gil Lauzon)

- | | | |
|------------------------------|----------------------------|--------------------------------|
| a. $f(x) = e^{x-1}$ | b. $g(x) = \ln(x+1)$ | c. $h(x) = 3 + e^{x-2}$ |
| d. $\nu(x) = \pi - \ln(x-1)$ | e. $\mu(x) = 5^{x+2}$ | f. $\xi(x) = \log_5(x+2)$ |
| g. $p(x) = 5 - 3^{2x+1}$ | h. $q(x) = 3 \ln(1 + e^x)$ | i. $r(x) = e^{(5-4 \ln(x+2))}$ |

5. Find the domain of the given function.

- | | | |
|--------------------------|--------------------------|------------------------------|
| a. $\ln(2x + 5)$ | b. $\ln(4 - 5x)$ | c. $\ln(x^2 - 7x + 6)$ |
| d. $\ln(4 - 3x - x^2)$ | e. $\sqrt{3 + \ln x}$ | f. $\sqrt{4 - \ln x}$ |
| g. $\frac{1}{2 + \ln x}$ | h. $\frac{2}{4 - \ln x}$ | i. $\frac{-3}{\sqrt{\ln x}}$ |
| j. $\sqrt{3 - e^{2x}}$ | k. $\sqrt{4 + e^{-x}}$ | l. $\sqrt{e^x - 5}$ |

Answers

- 1a. 3 1b. -3 1c. -1 1d. 1/2 1e. 1/2 1f. 1/4 1g. -1/2 1h. 3 1i. -2 1j. 7 1k. 1/25 1l. 10 2a. $\ln(x-1) + 2\ln(x+2)$
 2b. $\log_2(x-3) + \log_2(x+3)$ 2c. $.5\log(x-2) + .5\log(x-3)$ 2d. $\ln(x-\sqrt{3}) + \ln(x+\sqrt{3})$ 2e. $(5/3)\log(x-6) + (5/3)\log(x+1)$
 2f. $2\log_3 x + .75\log_3(2-x) - 3\log_3(x+3)$ 2g. $-\ln(x-1) + 2\ln(x+1) - 2\ln(3x+1)$ 2h. $-2 + \log(x-1) + \log(x+4)$ 2i. $\log_\pi(x-1) + \log_\pi(x+2) - \log_\pi(2x-5) - \log_\pi(x+4)$ 2j. $\ln(2x-3) + \ln(x+4)$ 2k. $\log 3 + \log(x+2) + \log(x-8)$ 2l. $10\log(x-3)$
 3a. $\ln((x-3)(x+1)^4)$ 3b. $\log_3(x^2-1)$ 3c. $\log(\sqrt{(x-4)(x+3)})$ 3d. $\ln((2x-1)\sqrt[3]{3x+4})$ 3e. $\log\left(\frac{(x-3)^2}{(4-x)^3}\right)$
 3f. $\ln\left(\frac{(3x+1)^2}{(2x-1)(4x+1)^3}\right)$ 3g. $\ln\left(\frac{e^3(x-1)}{(x+4)^5}\right)$ 3h. $\ln\left(x(x+4)^4\left(\frac{\sqrt[5]{2x-5}}{x+2}\right)^2\right)$ or $\ln\left(\frac{x(x+4)^4(2x-5)^{2/5}}{(x+2)^2}\right)$ 4a. $f^{-1}(x) = 1 + \ln x$; $D = (0, \infty)$; $R = (-\infty, \infty)$ 4b. $g^{-1}(x) = e^x - 1$; $D = (-\infty, \infty)$; $R = (-1, \infty)$ 4c. $h^{-1}(x) = 2 + \ln(x-3)$; $D = (3, \infty)$; $R = (-\infty, \infty)$ 4d. $\nu^{-1}(x) = 1 + e^{\pi-x}$; $D = (-\infty, \infty)$; $R = (1, \infty)$ 4e. $\mu^{-1}(x) = -2 + \log_5 x$ (also equals $-2 + \ln x / \ln 5$); $D = (0, \infty)$; $R = (-\infty, \infty)$ 4f. $\xi^{-1}(x) = 5^x - 2$; $D = (-\infty, \infty)$; $R = (-2, \infty)$ 4g. $p^{-1}(x) = .5(-1 + \ln(5-x)/(\ln 3))$; $D = (-\infty, 5)$; $R = (-\infty, \infty)$ 4h. $q^{-1}(x) = \ln(e^{x/3} - 1)$; $D = (0, \infty)$; $R = (-\infty, \infty)$ 4i. $r^{-1}(x) = -2 + e^{(5-\ln x)/4}$; $D = (0, \infty)$; $R = (-2, \infty)$ 5a. $(-5/2, \infty)$ 5b. $(-\infty, 4/5)$ 5c. $(-\infty, 1) \cup (6, \infty)$
 5d. $(-4, 1)$ 5e. $[e^{-3}, \infty)$ 5f. $(-\infty, e^4]$ 5g. $(0, e^{-2}) \cup (e^{-2}, \infty)$ 5h. $(0, e^4) \cup (e^4, \infty)$
 5i. $(1, \infty)$ 5j. $(-\infty, \frac{1}{2}\ln 3)$ 5k. $(-\infty, \infty)$ 5l. $(\ln 5, \infty)$