Advanced Functions – 4.2 WS: Exp and Log Functions Name: Key

I. State the translation(s), asymptote, domain, and range of each function using interval notation.

Given Exp/Log Function	Translation(s)	Asymptote	Domain	Range
1.) $f(x) = 3^x - 2$ Exp	down 2	HA: $y = -2$	$(-\infty, \infty)$	$(-2, \infty)$
2.) $f(x) = \log_4 (x - 3)$ Log	right 3	VA: $x = 3$	$(3, \infty)$	$(-\infty, \infty)$
3.) $f(x) = (\frac{1}{2})^{x+4}$ Exp	left 4	HA: $y = 0$	$(-\infty, \infty)$	$(0, \infty)$
4.) $f(x) = \log (x) + 5$ Log	up 5	VA: $x = 0$	$(0, \infty)$	$(-\infty, \infty)$
5.) $f(x) = e^{x-3} + 1$ Exp	right 3, up 1	HA: $y = 1$	$(-\infty, \infty)$	$(1, \infty)$
6.) $f(x) = \log_2 (x + 2) - 4$ Log	left 2, down 4	VA: $x = -2$	$(-2, \infty)$	$(-\infty, \infty)$
7.) $f(x) = \ln (x - 5) + 3$ Log	right 5, up 3	VA: $x = 5$	$(5, \infty)$	$(-\infty, \infty)$
8.) $f(x) = 4^{x+1} - 3$ Exp	left 1, down 3	HA: $y = -3$	$(-\infty, \infty)$	$(-3, \infty)$

II. Evaluate each expression or find the value of x. MUST SHOW WORK for credit!!

9.) $\log_2 x = 5$
$2^5 = x$
$x = 32$

10.) $\log_4 16 = x$
$4^x = 16$
$4^x = 4^2$
$x = 2$

11.) $\log_x 81 = 4$
$x^4 = 81$
$\sqrt[4]{x^4} = \sqrt[4]{81}$
$x = 3$

12.) $\log_5 \left(\frac{1}{125}\right) = x$
$5^x = \frac{1}{125}$
$5^x = 5^{-3}$
$x = -3$

13.) $\log_8 \left(\frac{1}{4}\right) = x$
$8^x = \frac{1}{4}$
$2^{3x} = 2^{-2}$
$3x = -2$
$x = -\frac{2}{3}$

14.) $4^{2\log_4 6}$
$4^{\log_4 6^2}$
$= 6^2$
$= 36$

15.) $e^{\frac{1}{2}\ln 9}$
$e^{\ln 9^{1/2}}$
$= e^{\ln \sqrt{9}}$
$= e^{\ln 3} = 3$

16.) $\log_3 \sqrt{27} = x$
$3^x = \sqrt{27}$
$3^x = (3^3)^{\frac{1}{2}}$
$x = \frac{3}{2}$

17.) $\log 2 + \log 5$
$\log (2 \cdot 5)$
$= \log_{10} 10 = x$
$10^x = 10^1$
$x = 1$

18.) $\log_2 \sqrt{\frac{1}{8}} = x$
$2^x = \sqrt{\frac{1}{8}}$
$2^x = (2^{-3})^{\frac{1}{2}}$
$x = -\frac{3}{2}$

19.) $\log_x 6 = \frac{1}{2}$
$x^{\frac{1}{2}} = 6$
$(\sqrt{x})^2 = (6)^2$
$x = 36$

20.) $\ln \left(\frac{1}{\sqrt[3]{e}}\right)$
$= \ln (e^{-1})^{\frac{1}{3}}$
$= \ln e^{-\frac{1}{3}} = -\frac{1}{3}$

21.) $\log_{81} 9 = x$
$81^x = 9$
$9^{2x} = 9^1$
$2x = 1$
$x = \frac{1}{2}$

22.) $\log_4 192 - \log_4 3$
$\log_4 \left(\frac{192}{3}\right)$
$\log_4 64 = x$
$4^x = 64$
$4^x = 4^3$
$x = 3$

23.) $\log_2 4 + 3\log_2 2$
$\log_2 4 + \log_2 8$
$\log_2 (4 \cdot 8)$
$\log_2 (32) = x$
$2^x = 32$
$2^x = 2^5$
$x = 5$

24.) $\log \sqrt[3]{100}$
$\log_{10} (10^2)^{\frac{1}{3}} = x$
$10^x = 10^{\frac{2}{3}}$
$x = \frac{2}{3}$

25.) $2\log_5 25 - \log_5 125$
$\log_5 625 - \log_5 125$
$\log_5 \left(\frac{625}{125}\right)$
$\log_5 5 = x$
$5^x = 5^1$
$x = 1$

26.) $e^{\ln 6 - \ln 15 + \ln 20}$
$e^{\ln (\frac{6}{15}) + \ln 20}$
$= e^{\ln (\frac{6 \cdot 20}{15})}$
$= \frac{120}{15} = 8$

27.) $\log_x 3 = \frac{1}{3}$
$x^{\frac{1}{3}} = 3$
$(\sqrt[3]{x})^3 = (3)^3$
$x = 27$

28.) $\left(\frac{1}{10}\right)^{4\log 5}$
$= (10^{-1})^{4\log 5}$
$= 10^{-4\log 5}$
$= 10^{\log 5^{-4}}$
$= 5^{-4}$
$= \frac{1}{625}$