***AAT (IC/HW)-Days 1-2** Name Key

Chapter 5: 5-3 Logarithmic Functions Date: _____ Period: _____

Change to logarithmic form.

1. (a) $4^3 = 64$ (b) $4^{-3} = \frac{1}{64}$ (c) $t^r = s$ (d) $3^x = 4-t$ (e) $(0.7)^t = 5.3$

$\log_4 64 = 3$ $\log_4 \frac{1}{64} = -3$ $\log_t s = r$ $\log_3(4-t) = x$ $\log_{.7}(5.3) = t$

Change to exponential form.

2. (a) $\log_2 32 = 5$ (b) $\log_3 \frac{1}{243} = -5$ (c) $\log_t r = p$ (d) $\log_3(x+2) = 5$ (e) $\log_2 m = 3x+4$

$2^5 = 32$ $3^{-5} = \frac{1}{243}$ $t^p = r$ $3^5 = x+2$ $2^{3x+4} = m$

Solve for t using logarithms with base a.

3. $A = Ba^{Ct} + D$

$A - D = Ba^{Ct}$

$\frac{A-D}{B} = a^{Ct}$; $\log_a\left(\frac{A-D}{B}\right) = Ct$

$\frac{1}{C}\log_a\left(\frac{A-D}{B}\right) = t$

4. $L = Ma^{t/N} - P$

$L + P = Ma^{t/N}$

$\frac{L+P}{M} = a^{t/N}$

$\frac{t}{N} = \log_a\left(\frac{L+P}{M}\right)$; $t = N\log_a\left(\frac{L+P}{M}\right)$

Change to logarithmic form.

5. (a) $10^5 = 100{,}000$ (b) $10^{-3} = 0.001$ (c) $10^x = y + 1$ (d) $e^7 = p$ (e) $e^{2t} = 3 - x$

$\log 100{,}000 = 5$ $\log .001 = -3$ $\log(y+1) = x$ $\ln p = 7$ $\ln(3-x) = 2t$

Change to exponential form.

6. $\log x = -8$ (b) $\log x = y - 2$ (c) $\ln x = 1/2$ (d) $\ln z = 7 + x$ (e) $\ln(t - 5) = 1.2$

$10^{-8} = x$ $10^{y-2} = x$ $e^{\frac{1}{2}} = x$ $e^{7+x} = z$ $e^{1.2} = t - 5$

Find the number, if possible.

7. (a) $\log_5 1 = x$ (b) $\log_3 3 = x$ (c) $\log_4(-2) = x$ (d) $\log_7 7^2 = x$ (e) $3^{\log_3 8} = B$

$5^x = 1$ $3^x = 3$ $4^x = -2$ $7^x = 7^2$

$x = 0$ $x = 1$ not possible $x = 2$

(f) $\log_5 125$ $\log_5 5^3 = 3$

(g) $\log_4 1/16$ $\log_4 4^{-2} = -2$

(h) $10^{\log 3}$ $10^{\log_{10} 3} = 3$

(i) $\log 10^5$ $\log_{10} 10^5 = 5$

(j) $\log 100$ $\log_{10} 10^2 = 2$

(k) $\log 0.0001$ $\log_{10} 10^{-4} = -4$

(l) $e^{\ln 2}$ $e^{\ln_e 2} = 2$

(m) $\ln e^{-3}$ $\ln_e e^{-3} = -3$

(n) $\log 10^{-6}$ $\log_{10} 10^{-6} = -6$

(o) $e^{1+\ln 5}$ $= e^1 e^{\ln 5}$ $= e(e^{\ln_e 5})$ $= e(5) = 5e$

Solve the equation.

8. $\log_4 x = \log_4 (8 - x)$

$x = 8 - x$

$2x = 8$

$x = 4$

9. $\log_3 (x + 4) = \log_3 (1 - x)$

$x + 4 = 1 - x$

$2x = -3$

$x = \frac{-3}{2}$

10. $\log x^2 = \log (-3x - 2)$

$x^2 = -3x - 2$

$x^2 + 3x + 2 = 0$

$(x+2)(x+1) = 0$

$x = -2, -1$

11. $\log_2 (x - 5) = 4$

$2^4 = x - 5$

$16 = x - 5$

$21 = x$

12. $\ln x^2 = -2$

$e^{-2} = x^2$

$\frac{1}{e^2} = x^2$

$x = \pm \frac{1}{e}$

13. $e^{-\ln x} = 0.2$

$(e^{\ln_e x})^{-1} = .2$

$x^{-1} = \frac{1}{5}$

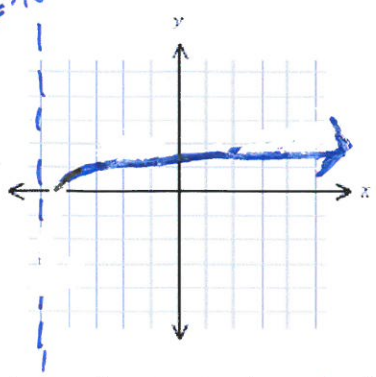
$\frac{1}{x} = \frac{1}{5}$

$x = 5$

Sketch the graph of f.

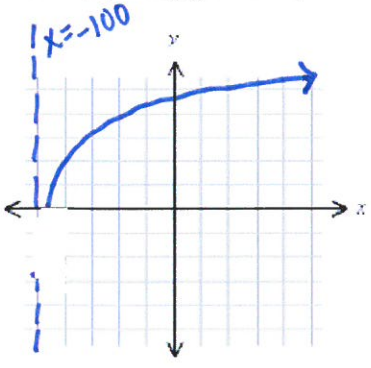
14. $f(x) = \log (x + 10)$

$x = -10$

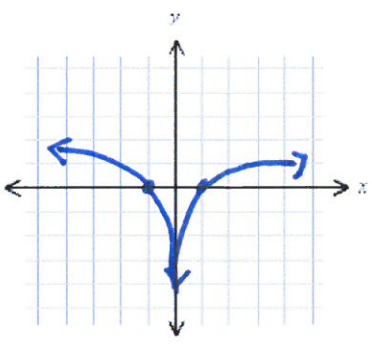


15. $f(x) = \log (x + 100)$

$x = -100$



16. $f(x) = \ln |x|$



Approximate x to three significant figures.

17. (a) $\log x = 3.6274$

$10^{3.6274} \approx 4240$

(b) $\log x = 0.9469$

$10^{.9469} \approx 8.85$

(c) $\log x = -1.6253$

$10^{-1.6253} \approx .0237$