Name: _____ **Period:** _____ **Date:** _____

PreCalculus Chapter 4 Practice Test

Answer the following questions. Be sure to show all work.

1. For $f(x) = 3^x$, evaluate the following:

a. $f(2)$ b. $f\left(-\frac{2}{3}\right)$ c. $f(\pi)$ d. $f(\sqrt{2})$

$= 9$ $3^{(2/3)} \approx 0.481$ $3^{\pi} \approx 31.544$ $3^{\sqrt{2}} \approx 4.729$

2. Sketch the graph of the following exponential functions making a table of values.

a. $f(x) = 3^x$

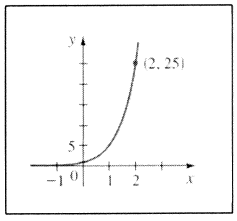
x	$f(x)$
-2	$1/9$
-1	$1/3$
0	1
1	3
2	9

b. $f(x) = \left(\frac{1}{3}\right)^x$

x	$f(x)$
-2	9
-1	3
0	1
1	$1/3$
2	$1/9$

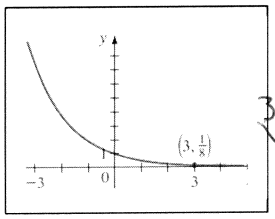
3. Find the exponential function $f(x) = a^x$ whose graph is given.

a.



for $f(x) = a^x + k$.
when $x = 0$, $a^0 = 1$ so $k = 0$.
$25 = a^2$
$5 = a$
$\Rightarrow f(x) = 5^x$

b.



when $x = 0$, $f(x) = 1$
so $k = 0$.
$\sqrt[3]{1/8} = \sqrt[3]{a^3}$
$a = 1/2$
$\Rightarrow f(x) = (1/2)^x$

4. Evaluate each expression correct to **five** decimal places.

a. $e^3 \approx 20.08554$ b. $2e^{-0.53} \approx 1.17721$ c. $e^{4.8} \approx 121.51042$

5. A sum of $1000 is invested at an interest rate of 12% per year. Find the amounts in the account after 3 years if interest is compounded annually, quarterly, and monthly.

Note: $\left(A(t) = P\left(1 + \frac{r}{n}\right)^{nt}\right)$ $r = 0.12$ $t = 3$ $P = 1000$

annual: $A(3) = 1000\left(1 + \frac{0.12}{1}\right)^{(1 \cdot 3)} \approx \$1404.92$

quarter: $A(3) = 1000\left(1 + \frac{0.12}{4}\right)^{(4 \cdot 3)} \approx \$1425.76$

monthly: $A(3) = 1000\left(1 + \frac{0.12}{12}\right)^{(12 \cdot 3)} \approx \$1430.76$

6. Find the amount after 3 years if \$1234 is invested at an interest rate of 8.4% per year, compounded continuously. Note: $A(t) = Pe^{rt}$ $r = .084$

$A(3) = 1234(e)^{(.084 \cdot 3)} \approx \$1587.65$

7. Express the equation in exponential form.

a. $\log_8 512 = 3$ $8^3 = 512$

b. $\log 0.1 = -1$ $10^{-1} = 0.1$

c. $\ln(x-1) = 4$ $e^4 = x-1$

8. Express the equation in logarithm form.

a. $81^{\frac{1}{2}} = 9$ $\log_{81} 9 = 1/2$

b. $7^3 = 343$ $\log_7 343 = 3$

c. $e^{0.5x} = t$ $\ln t = 0.5x$

d. $10^{-4} = 0.0001$ $\log 0.0001 = -4$

9. Evaluate the expression.

a. $\log_5 5^4$ ~~$4 \log_5 5$~~ $= 4$

b. ~~$\log_9 9$~~ 1

c. $\log_9 \sqrt{3} = \log_9 3^{1/2}$ $= 1/2 \log_9 3 = 1/2 (1/2)$ $= 1/4$

e. ~~$e^{\wedge} \ln \sqrt{5}$~~ $\sqrt{5}$

10. Use the Laws of Logarithms to combine or expand the expression.

a. $\log 12 + \frac{1}{2}\log 7 - \log 2$ $\log\left(\frac{12\sqrt{7}}{2}\right)$

b. $\log\left(\frac{a^2}{b^4\sqrt{c}}\right)$ $\log a^2 - (\log b^4 + \log \sqrt{c})$ $= 2\log a - 4\log b - 1/2 \log c$

c. $\log_2(xy)^{10}$ $10 \log_2(xy) = 10(\log_2 x + \log_2 y)$ $= 10\log_2 x + 10 \log_2 y$

d. ~~$\log_5(x^2-1) - \log_5(x-1)$~~ $\log_5\left(\frac{x^2-1}{x-1}\right)$

e. $2(\log_5 x + 2\log_5 y - 3\log_5 z)$ $2\left(\log_5 \frac{xy^2}{z^3}\right) = \log_5\left(\frac{xy^2}{z^3}\right)^2$

11. Solve the following equations:

a. $10^{-x} = 4$ $\log 10^{-x} = \log 4$ $-x = \log 4$ $x = -\log 4$ ≈ -0.602

b. ~~$\ln(2+x) = 1$~~ $e^{\ln(2+x)} = e^1$ $2 + x = e$ $x = e - 2$

c. $\log_5 x + \log_5(x+1) = \log_5 20$ ~~$\log_5(x(x+1)) = \log_5 20$~~ $x^2 + x = 20 \Rightarrow x^2 + x - 20 = 0$ $(x+5)(x-4) = 0$ $x = \cancel{-5}, 4$

d. $\log x + \log(x-3) = 1$ ~~$\log(x(x-3)) = 1$~~ 10^1 $x^2 - 3x - 10 = 0$ $(x-5)(x+2) = 0$ $x = 5, \cancel{-2}$

e. $7^{\frac{x}{2}} = 5^{1-x}$ ~~$\log_7 (7)^{x/2}$~~ $= \log_7 (5)^{1-x}$ $x/2 = \left(\frac{\log 5}{\log 7}\right)(1-x)$ $x = 2\frac{\log 5}{\log 7}(1-x)$ $x \approx 0.6234$ $\Rightarrow x + 2\frac{\log 5}{\log 7}x = 2\frac{\log 5}{\log 7}$ $\Rightarrow$ ~~$x = 0.5$~~

f. $\frac{10}{1+e^{-x}} = 2$ $\Rightarrow 10 = 2(1+e^{-x})$ $\Rightarrow$ ~~$10 = 2 + 2e^{-x}$~~ $5 = 1 + e^{-x}$ $\Rightarrow 4 = e^{-x}$ $\Rightarrow \ln 4 = \ln e^{-x}$ $\Rightarrow -x = \ln 4$ $\Rightarrow x = -\ln 4 \approx -1.3863$