Precalculus Chapter 3 Review Name key

Show all work to get any possible partial credit.

1.) Identify the asymptotes and intercepts for the following functions. If they don't exist, write NONE.

a.) $f(x)=5^{x-3}-2$

domain $\mathbb{R}$
horizontal asym. $y=-2$
x-intercept 3.43
y-intercept $\frac{-249}{125}$

$0=5^{x-3}-2$
$2=5^{x-3}$
$\log_5 2 = x-3$
$3+\log_5 2 = x$
$5^{-3}-2$
$\frac{1}{125}-2$

b.) $f(x)=\log_2(12x+6)-3$

domain $x > -\frac{1}{2}$
vertical asym. $x=-\frac{1}{2}$
x-intercept $\frac{1}{6}$
y-intercept $-.415$
$\log_2 6 - 3$

$12x+6>0$
$12x > -6$
$x > -\frac{1}{2}$
$0=\log_2(12x+6)-3$
$3=\log_2(12x+6)$
$2^3=12x+6$
$8=12x+6$
$2=12x$
$\frac{1}{6}=x$

2.) How much is the account worth after 7 years if \$3560 was invested in an account that earned 4.75% compounded a.) monthly? b.) continuously?

$A=3560\left(1+\frac{.0475}{12}\right)^{12\cdot 7}$ $A=3560e^{.0475\cdot 7}$

2.) a.) \$4960.98
b.) \$4964.24

3.) How much interest was earned in the account from question #2 when it was compounded monthly?

$4960.98-3560$

3.) \$1400.98

4.) Write the logarithmic equation in exponential form or write the exponential equation in logarithmic form. *Circle your answer.*

a.) $\log_7 16807=5$ $7^5=16807$

b.) $\ln(3x+y)=2$ $e^2=3x+y$

c.) $9^{-2}=\frac{1}{81}$ $\log_9 \frac{1}{81}=-2$

d.) $a^{8x}=4y$ $\log_a 4y=8x$

5.) Suppose $\log_a 4=2.4$, $\log_a 5=2.7$, and $\log_a 7=3.2$, use this information to find the value of

a.) $\log_a \frac{28}{5}=$ 2.9

$\log_a 7.4 - \log_a 5$
$\log_a 7 + \log_a 4 - \log_a 5$
$3.2 + 2.4 - 2.7$

b.) $\log_a 20-\log_a 35=$ -.8

$(\log_a 4+\log_a 5)-(\log_a 7+\log_a 5)$
$(2.4+2.7)-(3.2+2.7)$

6.) Use the properties of logarithms to combine the following expressions into one logarithmic expression.

a.) $3\ln x+2\ln y-5\ln z$ $\ln\left(\frac{x^3y^2}{z^5}\right)$

b.) $\ln x-2\ln(x+2)$ $\ln\left(\frac{x}{(x+2)^2}\right)$

7.) Solve for the variable. *Put all answers on the right. Show all work for possible partial credit.*

a.) $2^{-x} = 8$

$-x = \log_2 8$

$-x = 3$

$x = -3$

b.) $8e^{x-7} + 15 = 59$

$\frac{8e^{x-7}}{8} = \frac{44}{8}$

$e^{x-7} = 5.5$

$x - 7 = \ln 5.5$

$x = 8.7047$

c.) $\log_6(9x-12) = 3$

$6^3 = 9x - 12$

$216 = 9x - 12$

$228 = 9x$

$\frac{228}{9} = x \approx 25.\overline{3}$

d.) $\log(x) + \log(x-3) = 1$

$\log[x(x-3)] = 1$

$10^1 = x^2 - 3x$

$0 = x^2 - 3x - 10$

$0 = (x-5)(x+2)$

$x = 5$ $\quad x = -2$

e.) $\ln(x+4)^2 = 6$

$2\ln(x+4) = 6$

$\ln(x+4) = 3$

$e^3 = x + 4$

$-4 \quad -4$

$x = e^3 - 4$

a.) -3

b.) 8.7047

c.) $\frac{228}{9} \approx 25\frac{1}{3}$

d.) 5

e.) $e^3 - 4 \approx 16.085$

8.) Suppose the height h (in feet) of a tree at age t (in years) is $h = \frac{120}{1+200e^{-0.2t}}$

a.) What is the height of the tree when it is 10 years old?

b.) What is the height of the tree when it is 50 years old?

c.) At what age is the tree that is 103 feet? (round to four decimals)

a.) $4.275'$

b.) $118.92'$

c.) $t \approx 35.5$ yrs

a) $h = \frac{120}{1+200e^{-2}}$

$h \approx 4.275'$

b) $h = \frac{120}{1+200e^{-10}}$

$h \approx 118.92$

c) $103 = \frac{120}{1+200e^{-.2t}}$

$(1+200e^{-.2t}) \cdot 103 = \frac{120}{103} \cdot 103$

$1+200e^{-.2t} = 1.165$

$\frac{200e^{-.2t}}{200} = \frac{.165}{200}$

$e^{-.2t} = .00825$

$\frac{-.2t}{-.2} = \frac{\ln .00825}{-.2}$

9.) The radioactive isotope Hartlandium decays according to formula:

$H(t) = H_0(0.5)^{t/30}$, where H_0 is the initial amount of the isotope and t is the time in days.

What is the half-life of Hartlandium (in days)?

$\frac{1}{2}H_0 = H_0\left(\frac{1}{2}\right)^{t/30}$

$\left(\frac{1}{2}\right)^1 = \left(\frac{1}{2}\right)^{t/30}$

$1 = \frac{t}{30}$

$30 = t$

9.) 30 days

10.) Suppose you are driving your car when it is 20° F outside and your engine overheats at 220° F. When you park, the engine begins to cool down. The temperature T of the engine t minutes after you park satisfies the equation, $\ln\left(\frac{T-20}{200}\right) = -0.11t$.

a.) How many minutes will it take for the engine to cool down to 100° F?

$\ln\left(\frac{100-20}{200}\right) = -.11t$

$-.91629 = -.11t$

$t = 8.32$

a.) 8.32 minutes

b.) What is the temperature after 5 minutes?

$\ln\left(\frac{T-20}{200}\right) = -.55$

$200 \cdot e^{-.55} = \frac{T-20}{200} \cdot 200$

$115.3899 = T - 20$

$135.3899 = T$

b.) 135.3899 °F