Name _____ Date _____ Pre-Calculus 1

Unit 9 Review #2 – Exponentials and Logs

1. Simplify each of the following using properties of exponentials. (Calculator Section)

a. $\left(\frac{50x^4y^{-1}}{2y^{-5}z^2}\right)^{\frac{1}{2}}$

$\left(\frac{25x^4y^4}{z^2}\right)^{\frac{1}{2}}$

$\frac{5x^2y^2}{z}$

b. $\left(\frac{27x^{-3}y^9}{z^{-6}}\right)^{1/3} \cdot \left(\frac{16x^8}{z^{10}}\right)^{1/2}$

$\frac{3x^{-1}y^3}{z^{-2}} \cdot \frac{4x^4}{z^5} = \frac{12x^3y^3}{z^3}$

2. Simplify the following with one base and no fraction: $\frac{49^{6x^2}}{7^x}$ (Calculator Section)

$\frac{(7^2)^{6x^2}}{7^x} = \frac{7^{12x^2}}{7^x} = 7^{12x^2-x}$

3. In the year 1990, a painting was purchased at \$126,000. In the year 2005, the painting was worth \$137,000. Write an equation that models the amount the painting was worth after t years. (Calculator Section)

$137{,}000 = 126{,}000(1+r)^{15}$

$1.0873 = (1+r)^{15}$

$1.0056 = 1+r$

$.0056 = r$

$A = 126000(1.0056)^t$

4. The value of a car, y, in thousands, after t years can be modeled by the equation $y = 28(.88)^t$. It was purchased in the year 2010.

a. What was the initial value of the car?

\$28,000

b. By what percent is the car decreasing by per year?

12%

c. How much of the value remains from one year to the next?

88%

d. What is the value of the car in 2015?

$14,776.50

e. When will the car be worth half of its original value?

$14 = 28(.88)^t$ $\quad \log_{.88} .5 = t$

$.5 = .88^t$ $\quad t = 5.4$ years

5. Use $A(t) = 1500e^{0.4}$ to answer the following questions. The interest rate for this account is 4% (Calculator Section)

a. What is the value of the account?

$1561.22

b. What is the initial deposit?

$1500

c. How many years has the account been accumulating interest?

1

d. Circle one answer: This account was compounded _____.

Yearly Quarterly Monthly Weekly Daily (Continuously)

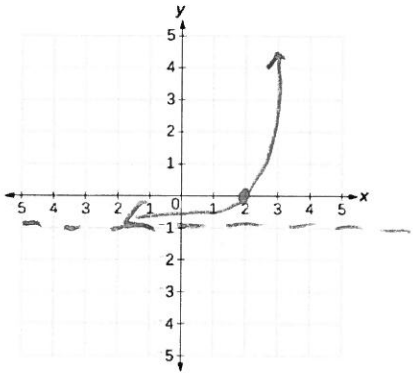
6. Calculate the initial deposit of an account that is worth $15,500.75 after earning 7.0% interest compounded semi-annually for 5 years. (Calculator Section)

$15,500.75 = P\left(1 + \frac{.07}{2}\right)^{10}$

$P = \$10,988.80$

7. Graph each of the following including one accurately plotted and labeled point. (Non-Calculator Section)

a. $f(x)=(3)^{x-2}-1$

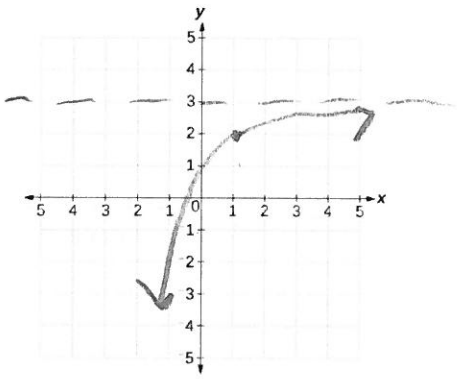


Equation of Asymptote: $y=-1$

Domain: $\mathbb{R}$

Range: $y>-1$

b. $g(x)=-\left(\frac{1}{2}\right)^{x-1}+3$

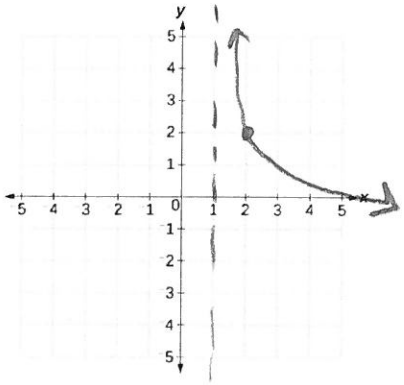


Equation of Asymptote: $y=3$

Domain: $\mathbb{R}$

Range: $y<3$

c. $h(x)=-\ln(x-1)+2$

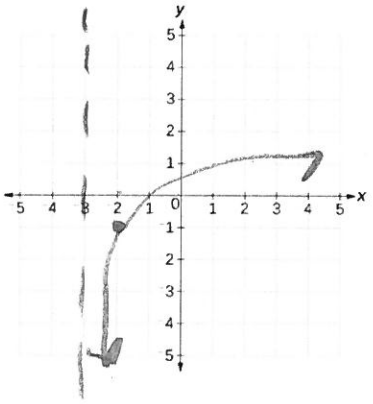


Equation of Asymptote: $x=1$

Domain: $x>1$

Range: $\mathbb{R}$

d. $f(x)=\log_3(x+3)-1$



Equation of Asymptote: $x=-3$

Domain: $x>-3$

Range: $\mathbb{R}$

8. Evaluate each of the following logarithms. (Non-Calculator Section)

a. $\log_2\left(\frac{1}{8}\right)$

-3

b. $\log_2 32^2-\log_3 81$

$2(5)-4$

6

c. $\ln\sqrt{e}$

$\frac{1}{2}$

d. $\log_4\left(\frac{1}{64}\right)$

-3

10. Use properties of logarithms to expand the following: $\log\left(\frac{4x^5}{y^6}\right)$ (Non-Calculator Section)

$\log 4 + 5\log x - 6\log y$

11. Use properties of logarithms to condense the following: $\frac{1}{2}\ln x + \frac{1}{2}\ln 16 - \ln 8$ (Non-Calculator Section)

$\ln \frac{x^{\frac{1}{2}}16^{\frac{1}{2}}}{8} = \ln \frac{x^{\frac{1}{2}}4}{8} = \ln \frac{\sqrt{x}}{2}$

12. Solve each of the following equations. (Non-Calculator Section)

You may leave logarithms in your answer since you will not have a calculator. Be sure to check your answers for extraneous solutions.

a. $\log_4(2x)+\log_4(x-1)=2$ (use calculator because quadratic is not factorable)

$\log_4 2x(x-1)=2$

$2x^2-2x=16$

$2x^2-2x-16=0$

$2(x^2-x-8)=0$

quad formula $\frac{1\pm\sqrt{(-1)^2-4(1)(-8)}}{2(1)}=\frac{1\pm\sqrt{33}}{2}$ 3.4 or -2.4

b. $\ln(x-2)-10=15$

$\ln(x-2)=25$

$e^{25}=x-2$

$e^{25}+2=x$

c. $\ln(2x+5) = \ln(x-1)$

$2x+5 = x-1$

$x = 6$

d. $16^{2x} = \left(\frac{1}{4}\right)^{-x-2}$

$(4^2)^{2x} = (4^{-1})^{-x-2}$

$4x = x+2$

$3x = 2$

$x = 2/3$

e. $3e^{6x} + 5 = 20$

$3e^{6x} = 15$

$e^{6x} = 5$

$\ln_e 5 = 6x$

$\frac{\ln_e 5}{6} = x$

f. $12^{4x} = 40$

$\log_{12} 40 = 4x$

$x = \frac{\log_{12} 40}{4}$