SARNO- Key

Name: Date:

Unit 5 Review Sheet- HONORS

1.) Austin deposits $5,000 into an account that pays 3.5% and is compounded quarterly. Sami deposits $5,200 into an account that pays 3.2% and is compounded monthly.

a. Write an expression for the amount of money Austin will have in his account after 5 years.

3.5% → .035 / 4 = .00875 (quarterly → 4) → ×4 = 20.

$y = 5000(1+.00875)^{20}$ or $y = 5000(1.00875)^{20}$

b. Write an expression for the amount of money Sami will have in her account after 5 years if she doesn't deposit any more money.

3.2% → .032 / 12 = .0027 → ×12 = 60

$5,200(1+.0027)^{60}$ or $5200(1.0027)^{60}$

c. How many years will it take Austin to reach $6584 in his bank account?

$\frac{6584}{5000} = \frac{5000(1.00875)^x}{5000}$ → $1.316 = 1.0087^x$ (A = 1.316, B = 1.0087, E = x)

$\log_{1.0087} 1.316 = x$

$\frac{\log 1.316}{\log 1.0087} = 31.7$

2.) Solve.

a. $(x-3)^3 = (64)^{1/3}$

$x - 3 = 4$

$x = 7$

b. $256^x = \frac{1}{16}$

$16^{2x} = \frac{1}{16}$ (reciprocal)

same base → $16^{2x} = 16^{-1}$

$2x = -1$

$x = -1/2$

c. $2^{3x+5} = 64^{x-7}$

$2^{3x+5} = 2^{6(x-7)}$

$2^{3x+5} = 2^{6x-42}$

$3x + 5 = 6x - 42$

$47 = 3x$

$x = 15.67$

3.) Solve.

a. $x^{1/4} - 2 = 3$

$+2 \quad +2$

$(x^{1/4})^4 = (5)^4$

$x = 625$

b. $4^x = 1$ (B^E = A → $\log_B A = E$)

$\log_4 1 = x$

change base → $\frac{\log(1)}{\log(4)} = 0$

or know anything to 0 power is 1.

c. $11 \cdot \frac{7\sqrt[3]{x}}{11} = 4 \cdot 11$

$\frac{7\sqrt[3]{x}}{7} = \frac{44}{7}$

rewrite as rational exp. → $\sqrt[3]{x} = 6.29$

$(x^{1/3})^3 = (6.29)^3$

$x = 248.35$

4.) An initial deposit of $500 is invested at 8.5% interest, compounded annually. How long will it take until the balance grows to $800? Growth

8.5% → .085

$y = a(1+r)^x$

$\frac{800}{500} = \frac{500(1+.085)^x}{500}$

in exponential form, turn to log form → $1.6 = (1.085)^x$ (A = 1.6, B = 1.085, E = x)

$\log_{1.085}(1.6) = x$

change base → $\frac{\log 1.6}{\log 1.085} = 5.76$

a. $6^x = 12$ → $\log_6 12 = x$

b. $\log_2 5 = x$ → $2^x = 5$

Changing from exponential to log form BAE or Bacon And Eggs

Changing from log to exponential

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5. Classify each statement as true or false. If false, change the second part to make it true.

a. If $6^x = 12$, then $x = \log_{12} 6$. → FALSE

b. If $\log_2 5 = x$, then $5^x = 2$. FALSE

c. If $2 \cdot 3^x = 11$, then $x = \dfrac{\log 11}{2 \log 3}$. FALSE

$2 \cdot 3^x = \frac{11}{2}$ → $3^x = 11$ → $\log_3 11 = x$ → $\frac{\log 11}{\log 3}$ *divide by 2 first

d. If $x = \dfrac{\log 7}{\log 3}$, then $x = \log_7 3$. false

$\frac{\log 3}{\log 7}$ *change of base → base denominator

6. The function $g(x) = 23(0.94)^x$ gives the temperature in degrees Celsius of a bowl of water x minutes after a large quantity of ice is added. After how many minutes will the water reach 5°C?

$5 = 23(0.94)^x$ → $.22 = .94^x$ → into → $\log_{.94}(.22) = x$

change base → $\frac{\log .22}{\log .94} = 24.47$

7. For the function g(x) above, is it exponential growth or decay and by what percentage rate?

Decay (it is less than 1)

by 6% (1 − .6) = .94

8.

Assume the United States' national debt can be estimated with the model $y = 2.07596(1.083415)^x$, where x represents the number of years since 1900 and y represents the debt in billions of dollars.

a. According to the model, when did the debt pass \$1 trillion (\$1,000 billion)?

b. According to the model, what is the annual growth rate of the national debt? 8.3%

c. What is the doubling time for this growth model?

a. $\log_{5.1} 247 = x$ → $\frac{\log 247}{\log 5.1} = 3.38$

b $17 + 1.25^x = 30$ → $1.25^x = 13$ → $\log_{1.25} 13 = x$ → 11.5

9. Use the properties of logarithms and exponents to solve these equations.

a. $5.1^x = 247$

b. $17 + 1.25^x = 30$

c. $\frac{27(0.93^x)}{27} = \frac{12}{27}$

$.93^x = .44$ → $\log_{.93} .44 = x$ → $11.31 = x$

d. $\log_x 81 = 3$

$(x^3)^{1/3} = (81)^{1/3}$ → $x = 4.33$