Name: _____ Date: _____ Hour: ____

Algebra II Worksheet Section 8.2

Directions: Solve the following problems assuming no deposits or withdrawals.

1. Heather received $100.00 for her thirteenth birthday. If she saves it in a bank with 5% interest compounded quarterly, how much money will she have in the bank by her 16th birthday?

$A = 100\left(1 + \frac{.05}{4}\right)^{4 \cdot 3} = \$116.08$

2. Roland earned $1500 last summer. If he deposited the money in a certificate of deposit that earns 12.5% interest compounded monthly, how much money will he have next summer?

$A = 1500\left(1 + \frac{.125}{12}\right)^{12 \cdot 1} = \$1698.62$

3. The C.R.E.A.M. company has a savings plan for their employees. If an employee makes an initial contribution of $2500 and the company pays 7.5% interest compounded quarterly, how much money will the employee have after 10 years?

$A = 2500\left(1 + \frac{.075}{4}\right)^{4 \cdot 10} = \$5255.87$

4. Juan invests $7500 at 12% interest for one year. How much money would he have if the interest was compounded…

   a. yearly? $A = 7500\left(1 + \frac{.12}{1}\right)^{1} = \$8400$

   b. daily? $A = 7500\left(1 + \frac{.12}{365}\right)^{365 \cdot 1} = \$8456.06$

5. Carmen is saving for a new car which will cost $15,000. If she puts $5,000 in an account which earns 10% interest compounded monthly, how long will it take for her to save enough money to buy the car?

$\frac{15000}{5000} = \frac{5000}{5000}\left(1 + \frac{.1}{12}\right)^{12x}$

$3 = 1.0083^{12x}$

graph & intersection

Find the amount in a continuously compounded account for the given conditions.

6. Principal: $2000
   Annual interest: 5.1%
   Time: 3 yr

$A = 2000e^{.051 \cdot 3} = \$2330.65$

7. Principal: $400
   Annual interest: 7.6%
   Time: 1.5 yr

$A = 400e^{.076 \cdot 1.5} = \$448.30$

8. Principal: $950
   Annual interest: 6.5%
   Time: 10 yr

$A = 950e^{.065 \cdot 10} = \$1819.76$

9. There are 10 grams of Curium-245 which ahs a half-life of 9,300 years. How many grams will remain after 37,200 years?

$y = 10\left(\frac{1}{2}\right)^{\frac{x}{9300}}$ $y = 10\left(\frac{1}{2}\right)^{\frac{37200}{9300}} = .625\,g$

10. There 80 grams of Cobalt-58 which have a half-life of 71 days. How many grams will remain after 213 days?

$y = 80\left(\frac{1}{2}\right)^{\frac{x}{71}} = 80\left(\frac{1}{2}\right)^{\frac{213}{71}} = 10\,g$

11. The half-life of Rhodium-105 is 1.5 days. If there are initially 7500 grams of this isotope, how many grams would remain after 30 days?

$y = 7500\left(\frac{1}{2}\right)^{\frac{x}{1.5}}$ $y = 7500\left(\frac{1}{2}\right)^{\frac{30}{1.5}} = .00715\,g$

12. Two hundred ten years ago there were 132,000 grams of Cesium-137. How much is there today? The half-life of Cesium is 30 years.

$y = 132000\left(\frac{1}{2}\right)^{\frac{x}{30}}$ $y = 132000\left(\frac{1}{2}\right)^{\frac{210}{30}} = 1031.25\,g$

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Algebra II Review 8.1 – 8.3

In problems 1 – 4, evaluate each function to the nearest hundredth for x = -2, -1, 0, 1, and 2. Graph each function.

1. $y = 2(0.3)^x$ $2\left(\frac{3}{10}\right)^x$

-2	-1	0	1	2
$\frac{200}{9}$	$\frac{20}{3}$	2	$\frac{3}{5}$	$\frac{9}{50}$

2. $y = \frac{2}{3}(3)^x$

-2	-1	0	1	2
$\frac{2}{27}$	$\frac{2}{9}$	$\frac{2}{3}$	2	6

3. $y = 2\left(\frac{1}{5}\right)^x$

-2	-1	0	1	2
50	10	2	$\frac{2}{5}$	$\frac{2}{25}$

4. $y = \frac{1}{4}(2)^x$

-2	-1	0	1	2
$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1

5. A new car that sells for $18,000 depreciates 25% each year. Write a function that models the value of the car. Find the value of the car after 4 yr.

$18{,}000(.75)^4 = \$5695.31$

6. The price of a new home is $126,000 and appreciates 2% each year. Write a function that models the value of the home. Find the value of the home after 10 yr.

$126{,}000(1.02)^{10} = \$153{,}593.30$

7. The bear population increases at a rate of 2% per year. There are 1573 bear this year. Write a function that models the bear population. How many bears will there be in 10 yr?

$1573(1.02)^{10} = 1917$

8. A tree 3 ft tall grows 8% each year. Write a function that models the height of the tree. How tall will the tree be at the end of 14 yr? Round your answer to the nearest hundredth.

$3(1.08)^{14} = 8.81$ ft

In problems 9 – 12, write an exponential function $y = ab^x$ for a graph that includes the given points.

9. (0, 2), (1, 1.3) $1.3 = ab^1$, $2 = ab^0 \rightarrow 2 = a$, $.65 = b$, $y = 2(.65)^x$

10. (-1, 12.5), (4, 4.096) $12.5 = a\left(\frac{8}{10}\right)^{-1}$, $12.5 = a \cdot \frac{10}{8}$, $a = 10$, $4.096 = ab^4$, $12.5 = ab^{-1}$, $.32768 = b^5$, $.8 = b$, $y = 10(.8)^x$

11. (1, –8), (2, –32) $-32 = ab^2$, $-8 = ab^1$, $-8 = a(4)^1$, $-2 = a$, $4 = b$, $y = -2(4)^x$

12. (2, 6400), (4, 4096) $\frac{4096 = ab^4}{6400 = ab^2}$, $b = .8$, $a = 10{,}000$, $y = 10{,}000(.8)^x$

In 13 and 14, Find the amount in a continuously compounded account for the given conditions:

13. Principal: $5000
Annual interest: 6.9%
Time: 30 yr

$A = 5000e^{.069(30)} = \$39624.12$

14. Principal: $20,000
Annual Interest: 3.75%
Time: 2 yr

$A = 20{,}000e^{.0375(2)}$
$A = \$21{,}557.68$

15. HG-197 is used in kidney scans. It has a half-life of 64.128 h. Write the exponential decay function for a 12-mg sample. Find the amount remaining after 72 h.

$y = 12\left(\frac{1}{2}\right)^{x \div 64.128}$

$y = 12\left(\frac{1}{2}\right)^{72 \div 64.128}$

$y = 5.51$ mg

16. I-123 is used in thyroid scans. It has a half-life of 13.2 h. Write the exponential decay function for a 45-mg sample. Find the amount remaining after 5 h.

$y = 45\left(\frac{1}{2}\right)^{x/13.2}$ $y = 45\left(\frac{1}{2}\right)^{5/13.2}$ $y = 34.6\text{mg}$

17. Suppose you invest \$5000 at an annul interest of 6.9%, compounded monthly.

a. How much will you have in the account after 10 years?

$A = 5000\left(1 + \frac{.069}{12}\right)^{12 \cdot 10} = \$9948.90$

b. Determine how much more you would have if the interest were compounded continuously.

$A = 5000e^{.069 \cdot 10} = \$9968.58$

$9968.58 - 9948.90 = \$19.68$ more

18. Suppose you invest \$8,400 at an annual interest of 4.5%, compounded quarterly.

a. How much will you have in the account after 10 years?

$A = 8400\left(1 + \frac{.045}{4}\right)^{4 \cdot 10} = \$13140.77$

b. Determine how much more you would have if the interest were compounded continuously.

$A = 8400e^{.045 \cdot 10} = \$13,173.82$

$13173.82 - 13140.77 = \$33.05$ more

In problems 19 – 21, write each equation in exponential form.

19. $\log_4 256 = 4$ $4^4 = 256$

20. $\log_5 125 = 3$ $5^3 = 125$

21. $\log_{17} 289 = 2$ $17^2 = 289$

In problems 22 – 24, write each equation in logarithmic form.

22. $9^2 = 81$ $\log_9 81 = 2$

23. $5^4 = 625$ $\log_5 625 = 4$

24. $6^{-3} = \frac{1}{216}$ $\log_6 \frac{1}{216} = -3$

In problems 20 – 25, evaluate each logarithm.

25. $\log_2 16$

$16 = 2^x$ $2^4 = 2^x$ $x = 4$

26. $\log_2 8$

$8 = 2^x$ $2^3 = 2^x$ $x = 3$

27. $\log_2 \frac{1}{8}$

$\frac{1}{8} = 2^x$ $2^{-3} = 2^x$ $x = -3$

28. $\log_{11} 121$

$121 = 11^x$ $11^2 = 11^x$ $x = 2$

29. $\log 100{,}000$

$10^x = 100000$ $10^x = 10^5$ $x = 5$

30. $\log_{\frac{1}{4}} 32$

$\left(\frac{1}{4}\right)^x = 32$ $2^{-2x} = 2^5$

$-2x = 5$ $x = -\frac{5}{2}$

In 31 and 32, graph the following.

31. $y = \log_2 x$

x	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4
$y = 2^x$	-2	-1	0	1	2

$y = \log_2 x$ has ordered pairs $\left(\frac{1}{4}, -2\right)\left(\frac{1}{2}, -1\right)(1,0)(2,1)(4,2)$

32. $y = \log_3 x$

x	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9
$y = 3^x$	-2	-1	0	1	2

graph of $y = \log_3 x$ has ordered prs. $\left(\frac{1}{9}, -2\right)\left(\frac{1}{3}, -1\right)(1,0)(3,1)(9,2)$