Name Schlansky
Mr. Schlansky

Date _____
Algebra II

Exponential Modeling Finding t

1. Megan opens a savings account with $5,000 in it. If interest is compounded weekly at a rate of 4.3%, write an equation for $b(t)$, the balance of her account after t years. Using your equation, how long will it take for Megan's money to reach $8,000? to the nearest tenth

P n formula n=52

A=b(t)
P=5,000
r=.043
n=52
t=t

$A=P(1+\frac{r}{n})^{nt}$

$b(t)=5{,}000(1+\frac{.043}{52})^{52t}$

$b(t)=5{,}000(1.000826923)^{52t}$

$\frac{8000}{5000}=\frac{5000(1.000826923)^{52t}}{5000}$

$\log 1.6=\log 1.000826923^{52t}$

$\log 1.6=52t\log 1.000826923$

$\frac{\log 1.6}{52\log 1.000826923}=\frac{52t\log 1.000826923}{52\log 1.000826923}$

11 = t

half life

2. One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Create an equation for $a(t)$, the amount of Iodine-131 remaining after t days. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

A=a(t)
P=20
t=t
h=8.02

$A=P(\frac{1}{2})^{\frac{t}{h}}$

$a(t)=20(\frac{1}{2})^{\frac{t}{8.02}}$

$\frac{7}{20}=\frac{20(\frac{1}{2})^{\frac{t}{8.02}}}{20}$

$\log .35=\log(\frac{1}{2})^{\frac{t}{8.02}}$

$8.02(\log .35)=\frac{t}{8.02}\log(\frac{1}{2})$

$\frac{8.02\log .35}{\log(\frac{1}{2})}=\frac{t\log(\frac{1}{2})}{\log(\frac{1}{2})}$

12 = t

P

3. Tyler opens a bank account with $5,450 with an annual interest rate of 5.3% compounded continuously. Write an equation for $b(t)$, the balance of Tyler's account after t years. Using your equation, to the *nearest hundredth of a year*, how long will it take for Tyler's account to triple?

Pert

A=b(t)
P=5450
r=.053
t=t

$A=Pe^{rt}$

$b(t)=5450e^{.053t}$

$\frac{16350}{5450}=\frac{5450e^{.053t}}{5450}$

$\ln 3=\ln e^{.053t}$

$\ln 3=.053t\ln e$

$\frac{\ln 3}{.053}=\frac{.053t}{.053}$

20.73 = t

b(t)=3(5450)
b(t)=16350

illegible time

4. Jessica deposits $2000 into a bank account where 4% interest is given every 2.4 years. Write an equation for $v(t)$, the value of Jessica's account after t years. Using your equation, to the *nearest tenth of a year*, how long will it take for Jessica's investment to reach $5000?

$A = v(t)$
$P = 2000$
$r = .04$
$t = t$
$h = 2.4$

$A = P(1+r)^{\frac{t}{h}}$
$v(t) = 2000(1+.04)^{\frac{t}{2.4}}$
$v(t) = 2000(1.04)^{\frac{t}{2.4}}$

$\frac{5000}{2000} = \frac{2000(1.04)^{\frac{t}{2.4}}}{2000}$
$\log 2.5 = \log 1.04^{\frac{t}{2.4}}$
$2.4(\log 2.5) = \frac{t}{2.4}\log 1.04$
$\frac{2.4\log 2.5}{\log 1.04} = \frac{t\log 1.04}{\log 1.04}$
$t = 56.1$

5. Manny opens a savings account with $6,400.00 with a 5.2% interest rate that is compounded quarterly. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, to the nearest *tenth of a year,* how long will it take for Manny's balance to double?

n formula $n = 4$

$t = b(t)$
$P = 6400$
$r = .052$
$n = 4$
$t = t$

$A = P(1+\frac{r}{n})^{nt}$
$b(t) = 6400(1+\frac{.052}{4})^{4t}$
$b(t) = 6400(1.013)^{4t}$

$b(t) = 2(6400) = 12800$

$\frac{12800}{6400} = \frac{6400(1.013)^{4t}}{6400}$
$\log 2 = \log 1.013^{4t}$
$\frac{\log 2}{4\log 1.013} = \frac{4t\log 1.013}{4\log 1.013}$
$13.4 = t$

illegible time

6. Christopher is preparing for the Nassau County Spelling Bee. Currently, Christopher knows 1200 words and will learn 20% more words every 4 days. Write an equation, $A(t)$, to represent how many words Christopher will be able to spell after t days. After how many days, to the *nearest day,* will Christopher be able to spell 5000 words?

$A = A(t)$
$P = 1200$
$r = .2$
$t = t$
$h = 4$

$A = P(1+r)^{\frac{t}{h}}$
$A(t) = 1200(1+.2)^{\frac{t}{4}}$
$A(t) = 1200(1.2)^{\frac{t}{4}}$

$\frac{5000}{1200} = \frac{1200(1.2)^{\frac{t}{4}}}{1200}$
$\log \frac{25}{6} = \log 1.2^{\frac{t}{4}}$
$(\log \frac{25}{6}) = (\frac{t}{4}\log 1.2)4$
$\frac{4\log\frac{25}{6}}{\log 1.2} = \frac{t\log 1.2}{\log 1.2}$
$31 = t$

7. If a bank account was opened with $3000 and interest is compounded continuously at 5.2%. Write an equation for $v(t)$, the value of the account after t years. To the *nearest hundredth of a year*, how long will it take for the value of the account to reach $4000?

P Pert r

A = v(t)
P = 3000
r = .052
t = t

A = Pert
v(t) = 3000e^{.052t}

v(t)
4000 = 3000e^{.052t}
4/3 = e^{.052t}
ln 4/3 = ln e^{.052t}
ln 4/3 = .052t ln e
.052 .052
6.53 = t

Nothing below

8. Danielle bought a basketball card for $2125 its value is increasing by 4.1% each year. Create an equation for $v(t)$, the value of the basketball card after t years. Using your equation, how long will it take for the value of the basketball card to reach $10000? to the nearest year,

P t r

A = v(t)
P = 2125
r = .041
t = t

A = P(1±r)^t
v(t) = 2125(1+.041)^t
v(t) = 2125(1.041)^t

v(t)
10000 = 2125(1.041)^t
2125 2125
log 4.7.. = log 1.041^t
log 4.7.. = t log 1.041
log 4.7.. / log 1.041 = t log 1.041 / log 1.041

39 = t

9. Miguel opened a bank account with $1000 and interest is compounded monthly at a rate of 8.1%. Write an equation to represent $b(t)$, the balance of Miguel's account after t years. Using your equation, how much time, to the *nearest year*, will it take for Miguel's money to triple?

P r n=12 n formula

A = b(t)
P = 1000
r = .081
n = 12
t = t

A = P(1+r/n)^{nt}
b(t) = 1000(1+.081/12)^{12t}
b(t) = 1000(1.00675)^{12t}

b(t) = 3(1000) = 3000

3000 = 1000(1.00675)^{12t}
1000 1000
log 3 = log 1.00675^{12t}
log 3 = 12t log 1.00675
log 3 / 12 log 1.00675 = 12t log 1.00675 / 12 log 1.00675

14 = t

nothing below

10. Melanie bought a car for $52,000 and the car depreciates at a rate of 10% each year. Write an equation to represent the value of the car, $v(t)$, after t years. Using your equation, to the *nearest tenth of a year*, how long will it take until the value of her car reaches $22,000?

$A = v(t)$ $P = 52000$ $r = .10$ $t = t$

$A = P(1 \pm r)^t$

$v(t) = 52000(1 - .10)^t$

$v(t) = 52000(.9)^t$

$v(t)$

$\frac{22000}{52000} = \frac{52000(.9)^t}{52000}$

$\log .42.. = \log .9^t$

$\frac{\log .42..}{\log .9} = \frac{t \log .9}{\log .9}$

$8.2 = t$

11. Jennifer initially invested $4800 in a bank account compounded continuously at a rate of 5.8%. Write an equation for $C(t)$, the value of her account after t years. After how much time, to the *nearest tenth of a year*, will it take for Jennifer's money to double?

$A = C(t)$ $P = 4800$ $r = .058$ $t = t$

$A = Pe^{rt}$

$C(t) = 4800e^{.058t}$

$C(t) = 2(4800) = 9600$

$\frac{9600}{4800} = \frac{4800e^{.058t}}{4800}$

$\ln 2 = \ln e^{.058t}$

$\frac{\ln 2}{.058} = \frac{.058t \ln e}{.058}$

$11.915 = t$

12.0

12. The half-life of carbon-15 is 2.449 seconds. If Jackie has 17500 grams of carbon-15, write an equation for $j(t)$, the amount of grams of carbon-15 remaining after t seconds. After how much time will there be 500 grams of carbon-15 remaining? Round your answer to the *nearest tenth of a second.*

half life h

$A = j(t)$ $P = 17500$ $t = t$ $h = 2.449$

$A = P(\frac{1}{2})^{\frac{t}{h}}$

$j(t) = 17500(\frac{1}{2})^{\frac{t}{2.449}}$

$\frac{500}{17500} = \frac{17500(\frac{1}{2})^{\frac{t}{2.449}}}{17500}$

$\log \frac{1}{35} = \log \frac{1}{2}^{\frac{t}{2.449}}$

$2.449 \left(\log \frac{1}{35}\right) = \left(\frac{t}{2.449}\right) 2.449 \log \frac{1}{2}$

$\frac{2.449 \log \frac{1}{35}}{\log \frac{1}{2}} = \frac{t \log \frac{1}{2}}{\log \frac{1}{2}}$

$12.6 = t$