AFM HW 6 - EXPONENTIAL GROWTH AND DECAY NAME key

1. Convert the following percentages into a growth or decay factor (common ratio)

−12.5%	+ 1%	+ 4.3%	− 76%	+ 33%	− 2.6%
.875	1.01	1.043	1−.76 .24	1.33	.974

2. Annual sales for a fast food restaurant are $650,000 and are increasing at a rate of 4% each year. Write an exponential function to model the sales.

$y = 650{,}000(1.04)^x$

a) What are the sales after 7 years?

$650{,}000(1.04)^7$

$855,355.66

b) After how many years will the sales be $1,000,000?

$1{,}000{,}000 = 650{,}000(1.04)^x$

$\frac{20}{13} = 1.04^x$

$\log_{1.04} \frac{20}{13} = x$

$x = 10.984$ ~11 yrs

3. The population of a town is 2500 people and is decreasing at a rate of 3.5% each year. Write an exponential function to model the population.

$y = 2500(.965)^x$

a) What is the population of town after 5 years?

$2500(.965)^5$

$= 2092.07$

~2092 people

b) When will only half the population be left?

$1250 = 2500(.965)^x$

$\frac{1}{2} = .965^x$

$\log_{.965} \frac{1}{2} = x$

$x = 19.4556$ ~ $19\frac{1}{2}$yrs

4. The population of a school is 800 students and is increasing at a rate of 2% each year. Write an exponential function to model the population.

$y = 800(1.02)^x$

a) What is the population of the school after 9 years?

$800(1.02)^9$

$= 956.07$

~956 students

b) When will the school double in size?

$1600 = 800(1.02)^x$

$2 = 1.02^x$

$\log_{1.02} 2 = x$

$x = 35$ yrs

5. In 1991 Mr. Davis purchased his home for $160,000. Since then, the value of the home has increased about 5% each year. Write an exponential function to model the value of the home.

$y = 160{,}000(1.05)^x$

a) What is the value of Mr. Davis's home today?

2016 − 1991 → 25 yrs

$160{,}000(1.05)^{25}$

$541,816.79

b) When will the house be worth $750,000?

$750{,}000 = 160{,}000(1.05)^x$

$75/16 = 1.05^x$

$\log_{1.05} 75/16 = x$

$\boxed{x \sim 31\frac{1}{2} \text{ or } 32 \text{ yrs}}$

6. Find the amount in an account after 15 years if $5000 was initially invested and the account earns 8% annual interest compounded quarterly.

t=15
P=5000
r=.08
n=4

$A = 5000\left(1+\frac{.08}{4}\right)^{4\cdot 15}$

$A = 5000(1.02)^{60}$

$\boxed{\$16{,}405.15}$

7. Find the length of time needed to earn $124.49 if Megan invests $957.62 at 6.5% interest, compounded continuously.

A= 124.49+957.62=1082.11
P= 957.62
r=.065

$1082.11 = 957.62e^{.065t}$

$1.129999 = e^{.065t}$

$\ln 1.129999 = .065t$

$\boxed{t \sim 1.88 \text{ or } 2 \text{ yrs}}$

8. A savings account with interest compounded quarterly increased from $2500 to $3033.52 in three years. What annual interest rate did the account earn over this time period?

n=4
P=2500
A=3033.52
t=3

$3033.52 = 2500\left(1+\frac{r}{4}\right)^{4\cdot 3}$

$1.2134 = \left(1+\frac{r}{4}\right)^{12}$

$1.01625 = 1 + r/4$

$.01625 = r/4$

$.065 = r$

$\boxed{r = 6.5\%}$

9. If Amanda borrows $3500 from the bank for 6 months at 7 ½ % interest, compounded continuously, how much will she have to pay back?

P=3500
t=1/2
r=.075

$A = 3500e^{.075(1/2)}$

$\boxed{A \doteq \$3{,}633.74}$

10. If Paige invests $800 in an account for 6 years that compounds monthly and receives $168 interest, what is her annual interest rate?

P=800
t=6
n=12
A=800+168=968

$968 = 800\left(1+\frac{r}{12}\right)^{12\cdot 6}$

$1.21 = \left(1+\frac{r}{12}\right)^{72}$

$1.00265 = 1 + r/12$

$.00265 = r/12$

$.0318 = r$

$\boxed{r \sim 3.2\%}$