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Algebra II

Modeling Exponential Functions Practice

1. Joe Manana just opened a bank account with a $5000 initial balance. If the interest is compounded quarterly at a rate of 2.8%, how long would it take for his money to double? Round your answer to the *nearest tenth of a year*.

$A = 2(5000) = 10000$
$P = 5000$
$r = .028$
$n = 4$
$t = t$

$A = P(1+\frac{r}{n})^{nt}$
$10000 = 5000(1+\frac{.028}{4})^{4t}$
$\frac{10000}{5000} = \frac{5000(1.007)^{4t}}{5000}$
$\log 2 = \log(1.007)^{4t}$
$\log 2 = 4t \log 1.007$
$\frac{\log 2}{4 \log 1.007} = \frac{4t \log 1.007}{4 \log 1.007}$
$24.8 = t$

2. The half-life of substance X is 12.4 minutes. How much of a 300mg sample of substance X will remain after 1 hour to the *nearest milligram*?

$A = x$
$P = 300$
$t = 60 \text{ min}$
$h = 12.4 \text{ min}$

$A = P(\frac{1}{2})^{\frac{t}{h}}$
$x = 300(\frac{1}{2})^{\frac{60}{12.4}}$
$x = 10 \text{ mg}$

3. A bank account opened up 3 years ago with an initial balance of $12000 now has a balance of $12824. Find the annual growth rate, to the *nearest tenth of a percent*.

$A = 12824$
$P = 12000$
$r = r$
$t = 3$

$A = P(1+r)^t$
$\frac{12824}{12000} = \frac{12000(1+r)^3}{12000}$
$(1.06866)^{\frac{1}{3}} = ((1+r)^3)^{\frac{1}{3}}$
$1.02234 = 1+r$
$-1 \quad -1$
$r = .02234 \quad (100)$
2.234
2.2%

4. How much money is in a bank account opened 6.5 years ago with $2155.67 that is compounded weekly with an interest rate of 5.16% rounded to the *nearest cent*?

$A = A$
$P = 2155.67$
$r = .0516$
$n = 52$
$t = 6.5$

$A = P(1+\frac{r}{n})^{nt}$
$A = 2155.67(1+\frac{.0516}{52})^{52(6.5)}$
$A = \$3014.20$

5. The table below shows three different investment options in which Lauren can invest $8,000.

Option	Annual Interest Rate	Frequency of Compounding
A	6.45%	Annually
B	6.43%	Continuously
C	6.44%	Weekly

Which option will allow Lauren to earn the most money over the course of a four-year period? Justify your answer.

option C

Option A

$A=P(1+r)^t$

$A=8000(1+.0645)^4$

$A=10272.42$

Option B

$A=Pe^{rt}$

$A=8000e^{.0643(4)}$

$A=10346.43$

option C

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

$A=8000(1+\frac{.0644}{52})^{52(4)}$

$A=10348.92$

6. Jeff opened a bank account with a principal balance of $3000. Interest is compounded continuously at a rate of 1.3%. After how many years, to the *nearest tenth of a year*, will it take for Jeff's account to increase by 50%?

$A=1.5(3000)=4500$

$P=3000$

$r=.013$

$t=t$

$A=Pe^{rt}$

$\frac{4500}{3000}=\frac{3000e^{.013t}}{3000}$

$\ln 1.5=\ln e^{.013t}$

$\frac{\ln 1.5}{.013\ln e}=\frac{.013t\ln e}{.013\ln e}$

$31.2=t$

7. The principal value of a loan is $424,100. If there is $110,000 remaining on the loan after 19 years, what was the annual rate of decrease to the *nearest tenth of a percent*?

$A=110000$

$P=424100$

$r=r$

$t=19$

$A=P(1-r)^t$

$\frac{110000}{424100}=\frac{424100(1-r)^{19}}{424100}$

$\left(\frac{1100}{4241}\right)^{\frac{1}{19}}=\left((1-r)^{19}\right)^{\frac{1}{19}}$

$.9314..=1-r$

$-1 \quad -1$

$-.06856..=-r$

$100(.06856..)=r$

6.85620761

6.9%

8. Jay borrowed $15,000 from Aaron and they came to an agreement regarding how the interest will be paid. Every five days, the loan will accumulate 2.5% interest. To the *nearest day*, after how many days will Jay owe $25000?

$A=25000$

$P=15000$

$r=.025$

$t=t$

$n=5$

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

$\frac{25000}{15000}=\frac{15000(1+.025)^{\frac{t}{5}}}{15000}$

$\log\frac{5}{3}=\log(1.025)^{\frac{t}{5}}$

$5\left(\log\frac{5}{3}\right)=\left(\frac{t}{5}\log 1.025\right)5$

$5\log\frac{5}{3}=t\log 1.025$

$\frac{5\log\frac{5}{3}}{\log 1.025}=\frac{t\log 1.025}{\log 1.025}$

$103=t$