Name/Per: key

Target 7-4 Applications Homework

Write and equation for each problem and then solve accordingly.

1. Find a bank account balance if the account starts with $100, has an annual rate of 4%, how long will it take to double your money?

$200=100(1.04)^t$

$2=1.04^t$

$\log_{1.04} 2=t$

Equation: $y=100(1.04)^t$

Solution: $t\approx 17.7$ years

2. An adult takes 400 mg of ibuprofen. Each hour, the amount of ibuprofen in the person's system decreases by about 29%. How long until there are only 10mg of ibuprofen left in the body?

Equation: $y=400(.71)^t$

Solution: $t\approx 10.8$ hours

3. In 1985, there were 285 cell phone subscribers in the small town of Centerville; the number of subscribers increased by 75% per year after 1985. How long until the cell phone subscribers are above 25,000?

Equation: $y=285(1.75)^t$

Solution: $t\approx 8$ years

4. In 2003, the population of the town of Juniper was 9,562. By 2010, it was estimated at 18,942. Write an exponential function that could be used to model the population of Juniper. Write t in terms of the numbers of years since 2003. Predict the population in 2015. What rate is the population growing by?

$(0,9562)\ (7,18942)$

$18942=9562(b)^7$

$1.981=b^7$

$1.103=b$

$b=1.103$

$1+.103$

Equation: $y=9562(1.103)^t$

Solution: about 31,006

Growth rate: 10.3%

5. A laptop computer loses 8% of its value each month after it is purchased. If you purchase a new laptop for $2300 what will be the value after 3 months? In what month after purchase will the laptops worth fall below $1000?

$y=2300(1-.08)^t$ ← t in months

$1000=2300(.92)^t$

$.435=.92^t$

$\log_{.92} .435=t$

$t\approx 9.98$

Equation: $y=2300(.92)^t$

Solution: $1790.98

Solution: about the 10th month.

Name/Per:________________

6. The population of an animal species introduced into an area sometimes increases rapidly at first and then more slowly over time. A logarithmic function models this kind of growth. Suppose that a population of N rabbits in an area t months after the rabbits are introduced is given by the equation:

$$N = 550\log(4t + 2)$$

Use this model to predict the deer population after…

a. 4 months? $N = 550\log(4(4)+2) = 550\log 18$ ≈ 690 rabbits

b. 8 months? ≈ 842 rabbits

c. 3 years? $3 \cdot 12 = 36$ months ≈ 1190 rabbits

According to this model how long will it take for the rabbit population to reach 1000? $N = 1000$

$\frac{1000}{550} = \frac{550\log(4t+2)}{550}$

$1.818 = \log_{10}(4t+2)$

$10^{1.818} = 4t + 2$

$65.765 = 4t + 2$

$-2 \qquad -2$

$\frac{63.765}{4} = \frac{4t}{4}$

$\boxed{t \approx 15.94 \text{ months}}$

6. How much would you need to invest to get \$20,000 in 5 years at an annual interest rate of 8.5% compounded monthly?

$20000 = a\left(1 + \frac{.085}{12}\right)^{12t}$ $\quad t = 5$

$20000 = a(1.007)^{60}$

$\frac{20000}{1.5197} = \frac{a\, 1.5197}{1.5197}$

Equation: $20000 = a(1.007)^{12t}$

Solution: $\approx \$13160$

7. You deposit \$2000 in a bank account. Find when you have \$7,000 for the following situations:

a. The account pays 3.5% annual interest compounded monthly.

$7000 = 2000\left(1 + \frac{.035}{12}\right)^{12t}$

$3.5 = 1.0029^{12t}$

$\log_{1.0029} 3.5 = 12t$ $\qquad t \approx 36.05$

Equation: $y = 2000\left(1 + \frac{.035}{12}\right)^{12t}$

Solution: ≈ 36 years

b. The account pays 4.5% annual interest compounded quarterly.

$3.5 = \left(1 + \frac{.045}{4}\right)^{4t}$

$3.5 = 1.01125^{4t}$

$\log_{1.01125} 3.5 = 4t$ $\qquad t \approx 27.99$

Equation: $y = 2000(1.01125)^{4t}$

Solution: ≈ 28 years

c. The account pays 4% annual interest compounded yearly

$7000 = 2000(1.04)^{t}$

$3.5 = 1.04^{t}$

$\log_{1.04} 3.5 = t$ $\qquad 31.94$

Equation: $y = 2000(1.04)^{t}$

Solution: ≈ 32 years