

Determine whether each of the following is an application of growth or decay. Choose the formula that is appropriate, either  $y = a(1 + r)^t$  for a growth function, or  $y = a(1 - r)^t$  for a decay function. Read carefully to determine the variable that you are solving for. Substitute the given information into the formula and solve. Round appropriately. Conventionally, we round money to the nearest hundredth (cent).

1. Your grandparents purchased an acre of ocean front property in Panama City in 1960 for \$1800. If the value of the land has **appreciated** at an average rate of 11% each year, what is the value of the land today? Write a model for the function and find the value.

$$y = 1800(1 + .11)^{57}$$

$$\$689,735.05$$

2. In 1972, your Dad purchased his first car, a canary yellow Camaro, for \$2600. The car has **depreciated** at a rate of approximately 8.5% each year. What is the value of the car today? Write a model for the function and find the value.

$$y = 2600(1 - .085)^{45}$$

$$\$47.74$$

3. A car valued at \$14,900 today has **depreciated** at an average rate of 7.6% each year. If the car was purchased in 2001, estimate its purchase price.

$$14,900 = a(1 - .076)^{16}$$

$$\frac{14,900}{(1 - .076)^{16}} = a \quad a \approx \$52,775.79$$

4. In 1999, Edna invested \$5000 into an account whose balance today is \$9075.37. What is the interest rate she is earning on the account?

$$9075.37 = 5000(1 + r)^{18}$$

$$\frac{9075.37}{5000} = (1 + r)^{18} \rightarrow \left(\frac{9075.37}{5000}\right)^{\frac{1}{18}} = 1 + r$$

$$1.0336... = 1 + r$$

$$r \approx .0336$$

$$\approx 3.4\%$$

5. A construction company purchased a piece of heavy equipment in 2008. The equipment is now worth only **half** its purchase price. At what rate did the equipment **diminish** in value?

$$\frac{1}{2} = 1(1 - r)^9$$

$$\left(\frac{1}{2}\right)^{\frac{1}{9}} = 1 - r$$

$$.92587... = 1 - r$$

$$-.0741... = -r$$

$$r \approx .0741 \text{ or } \approx 7.4\%$$

6. A car purchased in the year 2000 is now considered to be worth **one third** of its purchase price. What is the depreciation rate of the car?

$$\frac{1}{3} = 1(1 - r)^{17}$$

$$\left(\frac{1}{3}\right)^{\frac{1}{17}} = 1 - r$$

$$.937... = 1 - r$$

$$-.0625... = -r$$

$$r \approx .0625$$

$$\text{or } \approx 6.3\%$$

7. If you wish to grow your savings by 40% in 5 years, what interest rate will you need to earn on an account paying simple interest?

$$1.4 = 1(1+r)^5$$

$$(1.4)^{\frac{1}{5}} = 1+r$$

$$1.0696... = 1+r$$

$$.0696 \approx r \quad \text{OR } r \approx 7.0\%$$

↑ you want all of what you started with  
(100% + 40% more)  
or 140% of initial amount  
↓ same as 1.4

8. A valuable painting was sold last week at auction for 20 times its purchase price in 1980. Estimate the appreciation rate of the painting.

Rates

$$20 = 1(1+r)^{37}$$

Final value ↑ starting value

$$(20)^{\frac{1}{37}} = 1+r$$

$$1.08... = 1+r$$

$$r \approx .0843...$$

$$\text{OR } \approx 8.4\%$$

9. A colony of bacteria doubles in 6 hours. What is its growth rate?

$$2 = 1(1+r)^6$$

$$2^{\frac{1}{6}} = 1+r$$

$$1.122... = 1+r$$

$$.1224 \approx r$$

$$\text{OR } r \approx 12.2\%$$

10. What is the depreciation rate of a laptop computer if it is worth 25% less than its purchase price after 6 months?

$$.75 = 1(1-r)^{.5}$$

↑ same as 6 months

$$(.75)^2 = 1-r$$

$$.5625 = 1-r$$

$$-.4375 = -r$$

$$r \approx 43.75\%$$

↑ this means that its worth is 75% of its purchase price

11. If your parents deposited \$1000 on the day you were born into an account that pays 5%, how much interest has the account earned to this point, assuming you have no other deposits or withdrawals?

FIND final amount first

$$y = 1000(1 + .05375)^{55}$$

$$y = \$17,806.04$$

$$- \$1000.00$$

Subtract principle

$$\$16,806.04$$

EVERYONE

WILL HAVE  
DIFFERENT  
ANSWER  
BASED ON  
YEAR OF  
BIRTH