HW 9-7

Start the warmup in our notes after checking your hw.
Test still Thursday this week.
Who's not here Friday?

1. a. decreasing b. 82 c. .25(Loss of 25%) d. .75 e. 46.1
2. a. increasing b. 154 c. .36(Gain of 36%) d. 1.36 e. 284.8
3. 1,406,413
4. $5695.31
5. 6%
6. d
7. See explanation on next slide
8. {6}

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For the given the equations, determine

a. Increasing or decreasing
b. The initial amount
c. The rate of change
d. The growth/decay factor
e. Find P(2) to the nearest tenth.

$P(t)=82(.75)^t$

a. decreasing
b. 82
c. $1-.75=.25$ Loss of 25%
d. .75
e. 46.1

$P(2)=82(.75)^2$

$P(t)=154(1.36)^t$

a. increasing
b. 154
c. $1.36-1=.36$ Gain of 36%
d. 1.36
e. 284.8

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Write an exponential function to model each situation and evaluate for the given value.

3. A population of 1,236,000 grows 1.3% per year. What will the population be in 10 years?

$P(t) = 1{,}236{,}000(1.013)^t$

$P(10) = 1{,}236{,}000(1.013)^{10}$

$\approx 1{,}406{,}413$

4. A new car that sells for \$18,000 depreciates 25% each year. What will the car be worth in 4 years?

$C(t) = 18000(.75)^t$

$C(4) = 18000(.75)^4$

$= \$5695.31$

5. A townhouse purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the ***nearest percent***.

$\frac{135{,}000}{100{,}000} = \frac{100{,}000(1+r)^5}{100{,}000}$

$\sqrt[5]{\frac{27}{20}} = \sqrt[5]{(1+r)^5}$ or $\left(\frac{27}{20}\right)^{1/5} = (1+r)^{5(1/5)}$

$1+r = 1.061858759$

6%

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6. Which of the following best describes the graph of $f(x) = 4^{-x}$? $f(x) = \left(\frac{1}{4}\right)^x$

a. It is an increasing function, and it approaches but never reaches the horizontal axis to the left of the origin.

b. It is an increasing function, and it approaches but never reaches the horizontal axis to the right of the origin.

c. It is a decreasing function, and it approaches but never reaches the horizontal axis to the left of the origin.

d. It is a decreasing function, and it approaches but never reaches the horizontal axis to the right of the origin.

7. A student says that the graph of $f(x) = 2^{x+3} + 4$ is a shift of 3 units up and 4 units to the right of the parent function. Describe and correct the student's error.

The student mixed up horizontal and vertical shift.
They also mixed up the direction of the horizontal shift.
This transformation moved left 3 units and up 4 units.

8. Solve and check algebraically for all values of x:

$\sqrt{x-5} + x = 7$

$-x \quad -x$

$(\sqrt{x-5})^2 = (7-x)^2$

$x-5 = (7-x)(7-x)$

$x-5 = 49 - 14x + x^2$

$-x+5 \quad +5 \quad -x$

$x^2 - 15x + 54 = 0$

$(x-6)(x-9) = 0$

$x-6=0 \quad | \quad x-9=0$

$x=6 \quad | \quad x=9$ reject

$\{6\}$

Check

$\sqrt{6-5} + 6 = 7$

$1+6=7$

$7 \stackrel{\checkmark}{=} 7$

Check

$\sqrt{9-5} + 9 = 7$

$2+9=7$

$11 \neq 7$

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More Word Problems Using Exponential Growth and Decay

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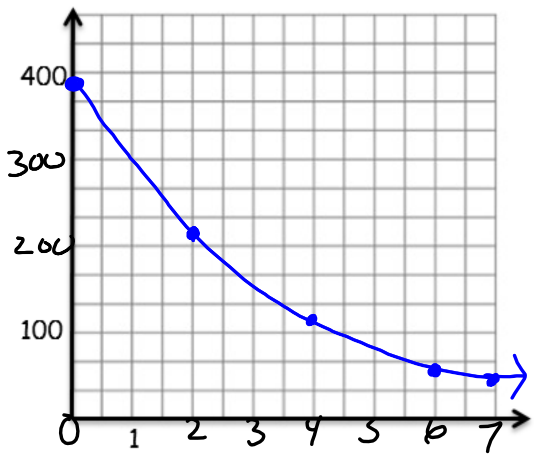
More Word Problems using Exponential Growth and Decay Unit 9 Day 8

Warm-up: Graph $y = 400(.85)^{2x} - 6$



x	0	2	4	6	7
y	394	202.8	103	50.9	35.1

Window

Xmin = 0
Xmax = 400
Xscl =
Ymin = 0
Ymax = 7

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Yesterday we worked on word problems that dealt with growth and decay models based off of being compounded annually. Today we are going to look at situations that deal with compounding any amount other than annually. If you look at the equation below you will see that there is a small adaptation to the formula.

$A(t) = a(1 \pm r)^t$ → Compounding Annually only

$\boxed{\text{Compound Interest Formula} \quad A(t) = a(1 \pm \frac{r}{n})^{nt}}$

where:

$A(t)$ → ending amount

r → rate as a decimal

a → initial amount

t → time usually in years

n → #compounds per year (# times to calculate interest per year)

$(1 \pm r)$ → Growth/Decay Factor $1+r$ / $1-r$

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Determine the amount a $4500 investment is worth after four years at the following interest rates: $a = 4500$ $t = 4$

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

5.4% compounded annually
$r = .054$
$n = 1$

$A(4) = 4500(1 + \frac{.054}{1})^{1(4)}$
$= \$5553.60$

5.4% compounded quarterly
$r = .054$
$n = 4$

$A(4) = 4500(1 + \frac{.054}{4})^{4(4)}$
$= \cancel{\$4797.97}$ $= \$5576.90$

5.4% compounded monthly
$r = .054$
$n = 12$

$A(4) = 4500(1 + \frac{.054}{12})^{12(4)}$
$= \$5582.26$

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You have $15000 to invest for five years. Fund A pays 13.2% interest compounded annually. Fund B pays 12.6% compounded quarterly. Fund C pays 12.5% compounded monthly. Which fund will return the most money? Justify your answer.

a= =t

Fund A: $r=.132$ $n=1$

$$A(5)=15000\left(1+\frac{.132}{1}\right)^{1(5)}=\$27,881.97$$

Fund B: $r=.126$ $n=4$

$$B(5)=15000\left(1+\frac{.126}{4}\right)^{4(5)}=\$27,891.76$$

Fund C: $r=.125$ $n=12$

$$C(5)=15000\left(1+\frac{.125}{12}\right)^{12(5)}=\$27,933.24$$

Answer: Fund C returns the most.

Apple stock was worth $10 a share in 1995. Due to Apple's success, the stock was worth $90 a share in 2017. Assuming exponential growth, approximate the annual growth rate, to the nearest tenth of a percent.

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If $6000 is put into a savings account that pays 3.5% interest compounded monthly, how much money, to the nearest ten cents, would be in the account after 6 years, assuming no money was added or withdrawn?

$$\frac{3.5}{100}=.035$$

$$A(t)=6000\left(1+\frac{.035}{12}\right)^{12t}$$

$$A(6)=6000\left(1+\frac{.035}{12}\right)^{12(6)}$$

$$=\$7,399.806$$ nearest 10 cents

$$\approx \$7,399.80$$

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