Test now Friday unless you won't be here. Then you will take Thursday.
Who's not here Friday?

Castle Learning Unit 9 Review is available for extra practice.

Notes today: 9-10, not 9-9 which is on hold
HW tonight: HW 9-10 NOT HW 9-9

Test Review is long. We will have class time tomorrow, but you're welcome to start it early.

Feb 11-10:27 AM

HW 9-8

1. $h(t) = 350{,}000(1.02)^t$ $h(10) = \$426648.05$

2. $v(t) = 20000(.90)^t$ $v(10) = \$7000$

3. a. \$21,226
b. \$21612
c. \$21701
d. \$21745

4. \$4332.57
Interest: \$332.57

5. a

6. b

Dec 7-10:25 AM

Name________________________________ Alg 2 HW 9-9

1. The price of a new home is $350,000. The value of the home appreciates 2% each year.
   a. Write a function to represent the value of the home, h, after t years.
   b. How much will the home be worth in 10 years?

a. $h(t) = 350{,}000(1.02)^t$

b. $h(10) = 350{,}000(1.02)^{10} = \$426{,}648.05$

2. A car that was originally worth $20,000 depreciates at a rate of 10% per year.
   a. Write a function to represent the value of the car, v, after t years.
   b. What is the value of the car after 10 years, to the nearest thousand dollars?

a. $v(t) = 20000(.90)^t$

b. $v(10) = 20000(.9)^{10} = \$7000$

Dec 7-10:06 AM

3. You have $8000 to put in a savings account that earns 5% interest. Leaving the money untouched, find the total amount, to the nearest dollar, you will have after 20 years if the interest is compounded
   a. Annually?

$f(20) = 8000(1.05)^{20} = \$21{,}226$

   b. Quarterly? $f(20) = 8000\left(1 + \frac{.05}{4}\right)^{20(4)} = \$21{,}612$

   c. Monthly? $f(20) = 8000\left(1 + \frac{.05}{12}\right)^{20(12)} = \$21{,}701$

   d. Daily? $f(20) = 8000\left(1 + \frac{.05}{365}\right)^{20(365)} = \$21745$

$n = 365$

Dec 7-10:08 AM

4. John has a summer job as a lifeguard. From his paychecks he keeps out a total of \$4000 to put in the bank at the end of the summer. He finds a bank that will pay 4% annual interest compounded monthly on an account if the account is maintained for two years. If John leaves his money there for 2 years, how much will he have in the account? How much interest will he earn?

$= 4000\left(1+\frac{.04}{12}\right)^{24}$ Interest: \$332.57

$= \$4332.57$

5. Which of the following best describes the graph of $f(x) = \left(\frac{1}{5}\right)^{-x}$? $= 5^x$

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

6. Which statement concerning the graph of the exponential function $y = 5^x$ is true?

a. The graph never intersects the graph of $y = 2^x$.
b. The graph passes through the point (0,1).
c. For $x < 0$, the graph can dip below the x-axis.
d. As x increases, the graph gets closer to the x-axis.

Dec 7-10:09 AM

Applications of the Rules of Exponents with Word Problems

Jan 10-4:15 PM

Applications of the Rules of Exponents with Word Problems Unit 9 Day 10

Percents and phenomena that grow at a constant percent rate can be challenging, to say the least. This is due to the fact that, unlike linear phenomena, the growth rate indicates a constant multiplier effect instead of a constant additive effect (linear). Because constant percent growth is so common in everyday life (not to mention in science, business, and other fields), it's good to be able to **mindfully manipulate percent**.

The power rule can be used to help convert time on word problems to different growth rates. For example, we are given the equation $\boxed{y = 7(.5)^t}$, where t represents time in years. You can use the power rule to manipulate the equation so the time, represented in years, could be represented in a different growth rate (months, days, weeks, etc.).

$(x^2)^3 = x^6$

Example# 1: **Monthly**

If t = 3 years, how many months would be equivalent to three years?

$3 \times 12 = 36$ months

So you would have to multiply your exponent t by 12.

Jan 10-4:53 PM

If we have only multiplied the exponent t by the conversion factor, we have actually created a completely ~~different equation~~. So by using the power rule we can convert the time and create an equation that is equivalent to the original equation. What power would we need to raise the base .5 to so that we have an equivalent equation?

$y = 7(.5)^{t \cdot 12} \neq 7(.5)^t$

$Y = 7(.5^{\frac{1}{12}})^{12t}$ $\quad \frac{1}{12} \cdot 12 = 1$

$y = 7(.5^{1/12})^{12t} = 7(.5)^t$

We could also evaluate the equation above using what we raised .5 by to create an equivalent equation

$.5^{1/12} = .9438743127$

$Y = 7(.9438743127)^{12t}$

Example #2: **Daily**

If t = 3 years, how many days would be equivalent to three years?

3×365 $\quad 1095$

So you would have to multiply your exponent t by 365.

So your new equation would need to be $Y = 7(.5^{\frac{1}{365}})^{365t}$ or $Y = 7(.998102687)^{365t}$

Now let's use this idea and apply it to other equations.

Example #3: Last year the total revenue for Wegmans increased by 6.25% over the previous year. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue?

1. $(1.0625)^t$
2. $(1.0625)^{12/t}$
3. $(1.00506)^t$
4. $(1.00506)^{t/12}$

Example #4: A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population, B(t), can be represented by the function $B(t) = 750(1.16)^t$, where the t represents the number of years since the study began.

In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

1. $B(t) = 750(1.012)^t$
2. $B(t) = 750(1.012)^{12t}$
3. $B(t) = 750(1.16)^{12t}$
4. $B(t) = 750(1.16)^{t/12}$

$(1.16)^{12t} \longrightarrow (1.16^{1/12})^{12t}$

$(1.012)^{12t}$

Example #5: Camryn puts $400 into a savings account that earns 6% annually. The amount in her account can be modeled by $C(t) = 400(1.06)^t$, where t is the time in years. Which expression best approximates the amount of money in her account using a weekly growth rate?

1. $400(1.001153846)^t$
2. $400(1.001121184)^t$
3. $400(1.001153846)^{52t}$
4. $400(1.001121184)^{52t}$

$(1.06^{\frac{1}{52}})^{52t}$

$(1.00112184)^{52t}$

Sometimes the conversion is already done and all we need to do is find an equivalent equation.

Example #6: Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams, A, of Iridium-192 present after t days would be $A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$ Which equation approximates the amount of Iridium-192 present after t days?

$\frac{t}{73.83} = t \cdot \frac{1}{73.83}$

1. $A = 100\left(\frac{73.83}{2}\right)^t$
2. ~~$A = 100\left(\frac{1}{147.66}\right)^t$~~ $= \frac{1}{2} \cdot \frac{1}{73.83}$
3. $A = 100(0.990656)^t$ → $.990656\,5511\,8$
4. $A = 100(0.116381)^t$

$A = 100\left(\frac{1}{2}^{1/73.83}\right)^t$

$\frac{1}{12}$

Example #7: An equation to represent the value of a car after t months of ownership is $v = 32{,}000(0.81)^{\frac{t}{12}}$. Which statement is not correct? False, 3 are true

$100 - 19 = 81\% \to .81$

T 1. The car lost approximately 19% of its value each month.
F 2. The car maintained approximately 98% of its value each month.
T 3. The value of the car when it was purchased was $32,000.
T 4. The value of the car 1 year after it was purchased was $25,920.

$t = \cancel{x}\ 12$

$V = 32000(.81)^{12/12} \stackrel{?}{=} 25920$

From HW9-9 #5: Try

5) ~~10 years ago~~ 80,000 sold 120,000

$r = ?$ nearest %

$A = 80{,}000(1+r)^t$

$A(t) =$

$\frac{120{,}000}{80{,}000} = \frac{80{,}000(1+r)^{10}}{80{,}000}$

$\sqrt[10]{1.5} = \sqrt[10]{(1+r)^{10}}$

$\sqrt[10]{1.5} = 1 + r$

$r = \sqrt[10]{1.5} - 1 \approx .04$

4%

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Feb 8-7:32 AM

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