Unit 3 Day 13
Review

Warm-up

1. You have inherited land that was purchased for $30,000 in 1960. The value of the land increased by approximately 5% each year. Write a function describing the value of the land as a function of time (let time be years after 1960).

   a.) Write an explicit equation to model the relationship.

   b.) Write a recursive (Now-Next) equation to model the relationship.

   c.) What was the value of the land in 2011?

   d.) In what year will the land be worth $50,000?

2. The value of an SUV can be modeled by the function $V(t) = 30{,}000(0.84)^t$, where t is the number of years since the car was purchased. To the nearest tenth of a percent, what is the ~~monthly~~ rate of depreciation?

   yearly

Warm-up ANSWERS

1. You have inherited land that was purchased for \$30,000 in 1960. The value of the land increased by approximately 5% each year. Write a function describing the value of the land as a function of time (let time be years after 1960).

   a.) Write an explicit equation to model the relationship.

   $y = 30{,}000(1.05)^x$

   b.) Write a recursive (Now-Next) equation to model the relationship.

   Next = Now * (1.05)   Start = 30,000

   c.) What was the value of the land in 2011?

   $x = 2011 - 1960 = 51$ $y = 30{,}000(1.05)^{51}$

   $= \$361{,}223.09$

   d.) In what year will the land be worth \$50,000?

   $50{,}000 = 30{,}000(1.05)^x$ Use logs to solve! ☺

   To check, let y1 = 50000, y2 = $30{,}000(1.05)^x$ then intersect. $x = 10.47 + 1960 = 1970.47$ -> 1970

Warm-Up Answers

2. The value of an SUV can be modeled by the function $V(t) = 30{,}000(0.84)^t$, where t is the number of years since the car was purchased. To the nearest tenth of a percent, what is the ~~monthly~~ rate of depreciation?

yearly

Use the b value to the rate! ☺

$$0.84 = b$$

$$0.84 = 1 - r$$

$$r = 1 - 0.84 = 0.16$$

$$r = 16\%$$

Homework

Packet p. 24-27 circled problems

*Study for Unit 3 Test!!

Homework Answers – Pg 22

1) 3
   $10^3 = 1000$

2) 1
   $10^1 = 10$

3) -3
   $10^{-3} = 0.001$

4) -4
   $10^{-4} = 0.0001$

5) -4
   $10^{-4} = 1/10000$

6) -2
   $10^{-2} = 1/100$

7) 2.13
   $10^{2.13} \sim 134$

8) -0.82
   $10^{-0.82} = 0.15$

9) 3.43
   $10^{3.43} = 2700$

Homework Answers – Pg 22 (continued)

10) $\log_5 125 = 3$

11) $\log_4 1024 = 5$

12) $\log_3 2187 = 7$

13) $\log_6 (1/216) = 3$

14) $\log_5 1/625 = -4$

15) $\log 0.001 = -3$

16) $4^5 = 1024$

17) $2^{-2} = \frac{1}{4}$

18) $6^4 = 1296$

19) $3^{-4} = 1/81$

20) $2^{-9} = 1/512$

21) $10^2 = 100$

Homework Answers – Pg 23

22) 0.5975	23) -0.3869	24) 1.6582
25) -0.1150	26) -8.1595	27) 13.9666
28) 0.9659	29) 1.39179	30) -1.0049

Notes p. 39-40 Applications

3) The world population in 2005 was 6.2 billion and growing exponentially at a rate of 1.14% per year. The function $P(t) = 6.2(10^{0.005t})$ provides a good model for the population growth pattern.

a. Explain how you can be sure that $P(0) = 6.2$

$$P(0) = 6.2(10^{0.005 \cdot 0}) = 6.2(10^0) = 6.2(1) = \boxed{6.2}$$

b. Show that $P(1) = 6.2 + 1.14\%(6.2)$

$$P(1) = 6.2 + 1.14\%(6.2) = 6.2(10^{.005 \cdot 1}) = 6.27$$

c. Find the time when world population would be expected to reach 10 billion if growth continues at the same exponential rate. Explain how to find this time in two ways - one by numerical or graphic estimation and the other by use of logarithms and algebraic reasoning.

log5

$$\frac{10}{6.2} = \frac{6.2(10^{.005t})}{6.2}$$

$$1.6129 = 10^{.005t}$$

$$\log 1.6129 = \log 10^{.005t}$$

$$\frac{\log 1.6129}{(.005 \log 10)} = \frac{\cancel{.005}t \cancel{\log 10}}{.005 \log 10}$$

$$\boxed{41.5217 = t}$$

Check Your Understanding p. 39

I. $5(10)^x = 450$

$\frac{5(10)^x}{5} = \frac{450}{5}$

$10^x = 90$

$\log 10^x = \log 90$

$\frac{x\log 10}{\log 10} = \frac{\log 90}{\log 10}$

$\boxed{x = 1.9542}$

II. $4(10)^{2x} = 40$

$\frac{4(10)^{2x}}{4} = \frac{40}{4}$

$10^{2x} = 10$

$10^{2x} = 10^1$

$2x = 1$

$\boxed{x = 1/2}$

OR

$\frac{4(10)^{2x}}{4} = \frac{40}{4}$

$(10)^{2x} = 10$

$\log(10)^{2x} = \log(10)$

$\frac{2x\log 10}{\log 10} = \frac{\log 10}{\log 10}$

$2x = 1$

$x = 1/2$

III. $5(10)^{4x-2} = 500$

$\frac{5(10)^{4x-2}}{5} = \frac{500}{5}$

$10^{4x-2} = 100$

$10^{4x-2} = 10^2$

$4x-2 = 2$

$4x = 4$

$\boxed{x = 1}$

OR

$\frac{5(10)^{4x-2}}{5} = \frac{500}{5}$

$10^{4x-2} = 100$

$\log 10^{4x-2} = \log 100$

$\frac{(4x-2)\log 10}{\log 10} = \frac{\log 100}{\log 10}$

$4x-2 = \frac{\log 100}{\log 10}$
$+2 \qquad +2$

$\frac{4x}{4} = \frac{\log 100}{4\log 10} + \frac{2}{4}$

$\boxed{x = \frac{\log 100}{4\log 10} + \frac{1}{2}}$

$\boxed{x = 1}$

IV. $8x^2 + 3 = 35$

$\frac{8x^2}{8} = \frac{32}{8}$

$x^2 = 4$

$\sqrt{x^2} = \sqrt{4}$

$\boxed{x = \pm 2}$

b. The population of the United States in 2006 was about 300 million and growing exponentially at a rate of about 0.7% per year. If that growth rate continues, the population of the country in year 2006 + t will be given by the function $P(t) = 300(10^{0.003t})$. According to that population model, when is the U.S. population predicted to reach 400 million? Check the reasonableness of your answer with a table or a graph of P(t).

$t = 41.65$

$2006 + 41.65 = 2047.65$

In the Year 2047

Review ANSWERS

Review (not in notes)

Find the solution to each equation algebraically.

1) $\sqrt{20x-6}=\sqrt{5x+39}$

x = 3

2) $2(x-2)^{2/3}-8=192$

x = 1002

3) $(x+7)^{1/2}-x=5$

x = -3

Review ANSWERS

4) Your new painting is valued at $2400. It's value depreciates 7% each year. The value is a function of time.

a) Write a recursive (next-now) equation for the situation

NEXT = Now * (.93) start = 2400

b) Write an explicit function for the situation

$y = 2400(.93)^x$

c) When will the painting be worth $1000?

During year 12

5) Graph $y = 2^{x+4} - 3$. Identify the domain, range, asymptotes, and transformations of the parent function $y = 2^x$.

Domain: All real #s

HA: $y = -3$

Range: $y > -3$

Transformation: Left 4, down 3

Homework

Packet p. 24-27 circled problems

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Whiteboard Review

Please pick up:

A whiteboard
A marker
A felt piece (for an eraser)

Given $f(x) = 3^x$ and $g(x) = 3^{x+2} + 4$

a.) Find the Domain of g(x). a.) all real numbers

$$(-\infty, \infty)$$

b.) Find the Range of g(x). b.) y > 4 or $(4, \infty)$

Given $f(x) = 3^x$ and $g(x) = 3^{x+2} + 4$

Find the asymptote of g(x).

$y = 4$

Compare $f(x) = 3^x$ and $g(x) = 3^{x+2} + 4$

Explain how the graph changed from the parent function.

up 4, left 2

Simplify the radical

$$\sqrt[4]{128x^7y^7}$$

$$2xy\sqrt[4]{8x^3y^3}$$

Simplify the radical

$$\sqrt[3]{-16a^3b^8}$$

$$-2ab^2\sqrt[3]{2b^2}$$

Solve for r.

$$3646 = 1 + 5(4r + 17)^{\frac{3}{2}}$$

16

Solve for n.

$$(n-27)^{\frac{3}{2}}=64$$

43

The population of Winnemucca, Nevada can be modeled by $P = 6191(1.04)^x$. By what percent did the population increase by each year?

4%

Solve for x.

$$26 = -1 + (27x)^{\frac{3}{4}}$$

3

Solve for v.

$$\sqrt{2v-7}=v-3$$

4

Simplify.

$$(81m^6)^{\frac{1}{2}}$$

$9m^3$

Solve for b.

$$3 = \sqrt{b - 1}$$

10

Mark bought a car for $25,000. Five years later is it is worth 22,000. What is the yearly rate of depreciation?

2.52%

Multiply

$$x^{1/2} \cdot x^{1/5}$$

$$x^{7/10}$$

Simplify.

$$3\sqrt{3y^3} - y\sqrt{27y}$$

0

How has the following been changed from the parent graph $f(x) = \log(x)$.

$$g(x) = \log(x+8) + 5$$

left 8, up 5

Simplify.

$$\sqrt[5]{576y^5x^{12}}$$

$$2x^2y\sqrt[5]{18x^2}$$

Solve for p.

$$\sqrt{-10+7p} = p$$

2, 5

Magnesium 27 had a half life of 9 years. Initially there are 50 grams. Write an expression that shows the amount of Magnesium 27 after x years.

$$y = 50\ (.5)^{x/9}$$

Simplify.

$$\left(\frac{\sqrt[3]{a^2}}{\sqrt{b}}\right)^{-6}$$

$$\frac{b^3}{a^4}$$

Solve for m.

$$5 \bullet 6^{3m} = 20$$

0.2579 or $\dfrac{\log 4}{3\log 6}$

Solve for x.

$$5(10)^{x+7} + 6 = 66$$

$$\frac{\log 12}{\log 10} - 7$$ or -5.9208

Maurice opened his swimming pool and everyday the chlorine content decreases exponentially. On the fourth day, there were 252.2 grams of chlorine. On the twentieth day there were 203.88 grams of chlorine. Find an equation that models the data.

$$y = 265.97(0.9868)^x$$

Find the inverse.

y = 4x + 5

$$y = \frac{x-5}{4}$$

Find the inverse.

$y = 3x^5 + 7$

$$y = \sqrt[5]{\frac{x-7}{3}}$$

Convert from exponential to logarithmic form.

$$6^x = 1296$$

$$\log_6 1296 = x$$

Convert from exponential to logarithmic form.

$$7^x = 343$$

$$\log_7 343 = x$$

Find an exponential equation that models the table.

Stage	0	1	2	3	4	5	6	7	8	9	10	11	12
People standing (or dots left)	30	26	19	17	14	12	11	9	8	8	5	5	2

$$y = 30.86\,(0.8319)^x$$

Homework

Packet p. 24-27 circled problems

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