How do we determine whether a sequence is arithmetic

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 7, Lesson 1
1. Warm-up
2. Arithmetic Sequences
3. ICA- Which one
4. Independent Work

Arithmetic Sequences

How do we determine whether a sequence is arithmetic?

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Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: Find the domain and range of the function

$$f(x) = \frac{3x}{x^2 - 25 = 0}$$

$ax^2 + bx + c$

$x^2 \qquad -15$

$1 \quad 0 \quad -25$

Calc

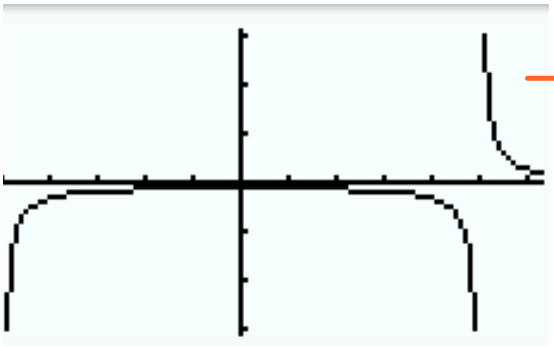
gEqu
F2 Poly
Degree? F1 : 2

Domain: $x \mid x \neq -5, x \neq 5$

Range:

x_1 5
x_2 -5

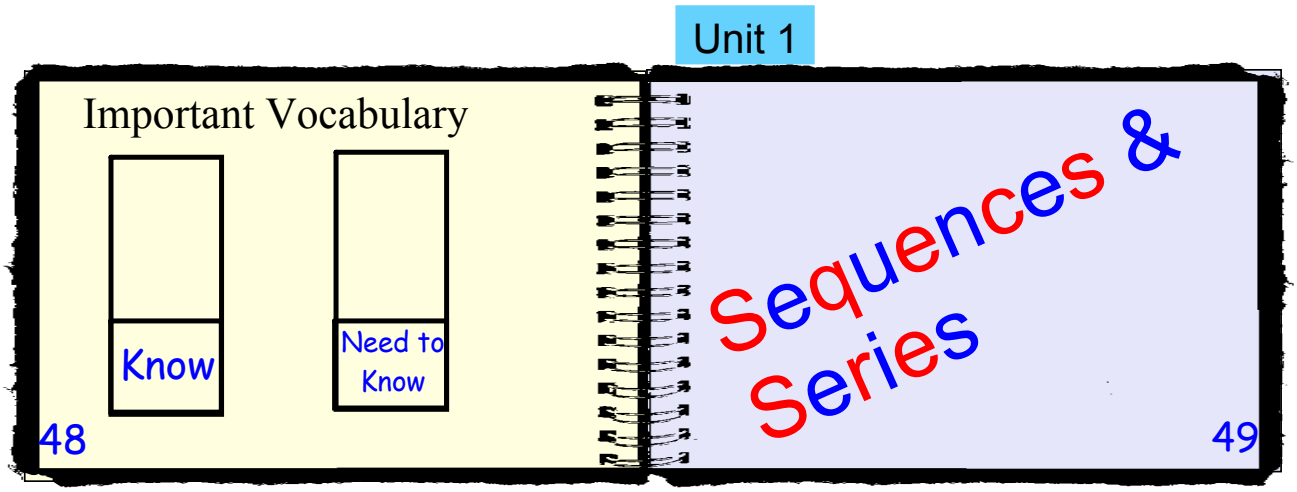
$$\frac{3}{x^2-25}$$



$y \mid y \neq 0$

$$\frac{3x}{x^2-25}$$

$y \mid y \in \mathbb{R}$


Unit 1
Important Vocabulary
Know
Need to Know
48
Sequences & Series
49

Midterm Study Guide

1. What is the 7th term of the geometric sequence 81 , 27 , 9 , ...
   A. 59,049
   B. 11
   C. .33
   D. -1

2. Joe's starting pay at work is $0.03 per day. His boss is doubling his pay each day. If he works for 17 days, how much money will he make total over the 17 days?
   A. $ 23,914.84
   B. $ 272.51
   C. $ 3932.13
   D. $ 1,966.08

3. You can choose OPTION A- starting pay of $30 per day with a pay *decrease* of $2 per day, or OPTION B- a starting pay of $0.05 per day where your pay *doubles* each day. If you work every day for 15 days, which method will earn the most TOTAL money after 12 days, and how much did you make?
   A. Option A- $ 228.00
   B. Option B- $ 204.75
   C. Option A- $ 102.40
   D. Option B- $ 8,191.75

4. Chip's cycling training charges $75 for the 1st hour, $70 for the 2nd hour, $65 for the 3rd hour, etc. How much do you owe in total if you hire him for an 8 hour training session?
   A. $ 460.00
   B. $ 488.28
   C. $ 40.00
   D. $ 1100.00

5. The graph shows the amount in your bank account at the beginning of each day. Which description about the graph is *NOT* true?

   A. You were paid on Tuesday morning
   B. You spent the most money on Thursday
   C. You were paid Saturday morning
   D. You were paid Friday morning

6. Using the window $-10 \le x \le 10$ and $-10 \le y \le 10$ what is the minimum point of the function $y = (x+4)^2 + 2.5$?
   A. (-2.5 , 4)
   B. (4 , -2.5)
   C. (2.5 , -4)
   D. (4 , -2.5)

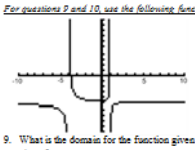
7. Using the window $-10 \le x \le 10$ and $-25 \le y \le 25$ find the local max and min of the function $f(x) = -\frac{2}{3}x^3 - 3.5x^2 + 4x + 7$
   A. Max: (.5 , 8.04) Min: (-4 , -22.33)
   B. Max: (-1 , 6.67) Min: (3 , -4)
   C. Max: (.72 , 8.31) Min: (2.78 , 5.39)
   D. Max: (-1 , 6.67) Min: (0 , 5)

8. What is the domain and range of the function $f(x) = 4x^2 - \frac{5}{x}$
   A. Domain: $x \mid x \neq \{5\}$ Range: $y \mid y \in \mathbb{R}$
   B. Domain: $x \mid x \neq \{5\}$ Range: $y \mid y > 0$
   C. Domain: $x \mid x \neq \{0\}$ Range: $y \mid y \in \mathbb{R}$
   D. Domain: $x \mid x \neq \{0\}$ Range: $y \mid y \ge 0$

Double-click to hide white spac

Show Your Work

For questions 9 and 10, use the following function:



9. What is the domain for the function given above?
   A. $x \mid x \neq 5$
   B. $x \mid x \neq \{-4, 1\}$
   C. $x \mid x \neq \{-1, 4\}$
   D. $x \mid x \in \mathbb{R}$

10. What is the range for the function given above?
    A. $y \mid y \neq \{-5\}$
    B. $y \mid y \neq \{-4, 1\}$
    C. $y \mid y \neq \{-1\}$
    D. $y \mid y \in \mathbb{R}$

11. The equation for a linear regression line was $y = -3.245x + 61.74$ with an r value of -0.851. Is this a dependable linear regression line?
    A. No because r is not close enough
    B. Yes because the slope is over 3
    C. No because r is negative
    D. Yes because r is close to -1

12. The following data shows the number of green t-shirts in 12 different classrooms.
    6 , 9 , 2 , 4 , 2 , 7 , 1 , 5 , 3 , 7 , 4 , 2
    Find the mean and standard deviation
    A. $\mu = 4.33$ $\sigma_x = 2.39$
    B. $\mu = 2.39$ $\sigma_x = 4.33$
    C. $\mu = 4$ $\sigma_x = 2$
    D. $\mu = 2$ $\sigma_x = 4$

13. Given the following data, run a chi-squared test of independence at 5% *significance* and determine if the two variables are independent.

	BOYS	GIRLS
PIZZA	47	42
SANDWICH	24	17

The critical value for this test is 3.84.
χ^2 is calculated to be .371

    A. Reject H_o because $\chi^2 >$ critical value
    B. Reject H_o because $\chi^2 <$ critical value
    C. Fail to reject H_o because $\chi^2 <$ critical value
    D. Fail to reject H_o because $\chi^2 >$ critical value

14. After Martin performed a chi squared test of independence at the 5% significance level to see if gender and car color are independent, the *p*-value was 0.009. What can he say about gender and the color of the car?
    A. He reject the null hypothesis, meaning the two are not independent
    B. He fail to reject the null hypothesis, meaning the two are independent
    C. He rejects if the test is valid at all
    D. He committed an error at some point during his calculations

15. The mean speed driven on a road is 49 mph. The standard deviation is 5 mph. What percent of drivers are in between 39 mph and 49 mph?
    A. 68%
    B. 50%
    C. 95%
    D. 47.7%

Standard 1.7

Arithmetic Sequences

Arithmetic Sequence- A pattern of numbers where you *ADD* the same number every time

i.e.: a_n = 4, 13, 22, 31, 40, 49, ...

+9 +9 +9 +9 +9

i.e.: a_n = 15, 11, 7, 3, -1, -5...

+-4 +-4 +-4 +-4 +-4

Common Difference- The number that is being added to find the next term

n^{th} term of an Arithmetic Sequence:

$$a_n = a_1 + d(n-1)$$

a_1: 1st term; d: common difference; n: term you are looking for

Standard 1.7

Arithmetic Sequences

Example 1- Given the arithmetic sequence, find the common difference, the *nth* term, *7th* term, and *120th* term of the sequence

$a_n =$ 52 , 45 , 38 , 31 , ...

-7 -7 -7

d: -7

nth: $a_n = 52 - 7(n-1)$

7th: $a_7 = 52 - 7(7-1)$ $52 - 42 = a_7 = 10$

120th: $a_{120} = 52 - 7(120-1)$ $52 - 833 = a_{120} = -781$

Example 2- If the *2nd* and *3rd* term of an arithmetic sequence are 1124 and 2157, then what is the common difference?

91 (a_1) 1124 (a_2) 2157 (a_3) d: 1033

Using that information, what is the *1st* term of the arithmetic sequence?

$a_1 = 91$

Example 3- Given the following information, find the formula for the *nth* term of the arithmetic sequence

8th term: 73 *13th* term: 48

108 (a_1) 103 (a_2) 98 (a_3) 93 (a_4) 88 (a_5) 83 (a_6) 78 (a_7) 73 (a_8) 68 (a_9) 63 (a_{10}) 58 (a_{11}) 53 (a_{12}) 48 (a_{13})

48 - 73 = -25

-25 ÷ 5

d = -5

$$a_n = 108 + (-5)(n-1)$$

Summary:

Which One?

$a_n = 87 + -4(n-1)$ $a_n = 112 + 7(n-1)$ $a_n = 64 + 11(n-1)$

Which sequence has a 14^{th} term of 207?

$$a_n = 64 + 11(n-1)$$

Which sequence has a 9^{th} term of 55?

$$a_n = 87 + -4(n-1)$$

Which sequence has a 10^{th} term of 175?

$$a_n = 112 + 7(n-1)$$

Homework

Find the domain and range

1. $f(x) = \dfrac{3x}{x^2 - 49}$

2. $g(x) = \dfrac{-7x}{4x - 36}$

3. $h(x) = \dfrac{8x}{3x^2 + 10x + 8}$

Find the formula for the nth term of the arithmetic sequence

4. $a_n = 72\ ,\ 81\ ,\ 90\ \ldots$

5. $1^{st}\ term: 112$

   $2^{nd}\ term: 162$

6. 4^{th} term: 41

   $11th$ term: 16.5

How are arithmetic functions related to linear functions?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 7, Lesson 2
1. Warm-up
2. Arithmetic Seq. & Linear Functions
3. ICA

Arithmetic Seq. & Linear Functions
How are arithmetic functions related to linear functions?

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Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: Find the domain and range of the following function

$$f(x) = \frac{5x}{x^2 - x - 30}$$

Equations → Poly

Fl: 2

$ax^2 + bx + c$

$x^2 \quad -x - 30$

$a \quad b \quad c$

$\begin{bmatrix} 1 & -1 & -30 \end{bmatrix}$

Domain: $x \mid x \neq -5, x \neq 6$

Range: $y \mid y \in \mathbb{R}$

x_1 6

x_2 $\begin{bmatrix} -5 \end{bmatrix}$

Notes Notes

Standard 1.7

Arithmetic Sequences and Linear Functions

Arithmetic sequences can be closely compared to a linear function.

$$a_n = a_1 + d \cdot (n-1)$$

$$f(x) = b + m \cdot x$$

$f(x) = a_n$

$b = a_1$

$m = d$

$x = (n-1)$

Standard 1.7

Arithmetic Sequences and Linear Functions

Example 1- For the following arithmetic sequence, find the formula for a_n, then find a_8, a_{12}, and a_{150}.

$a_n = 110, 175, 240, 305, 370, \ldots$

$a_n = 110 + 65(n-1)$

$a_8 = 110 + 65(8-1)$

$a_8 = 565$

$a_{12} = 110 + 65(12-1)$

$a_{12} = 825$

$a_{150} = 110 + 65(150-1)$

$a_{150} = 9795$

Example 2- Two Men and a Truck moving company charges a one-time fee of $110, then $65 per hour. Write a function for their cost

$f(x) = 110 + 65x$

What is the cost of a 7 hour job? $110 + 65(7) = 565$

The cost of a 7 hour job is $565.

What is the cost of a 12 hour job? $110 + 65(12) = 890$

The cost of a 12 hour job is $890.

Summary:

Example 3- At Massage Envy, a 1 hour massage costs $35. A 2 hour massage costs $70. At Cindy's Massage, a 1 hour massage costs $60, while a 2 hour massage costs $85.

35	70
1	2

+35

60	85
1	2

+25

Write a function for Massage Envy using *M(t)*

M(t)= 35+35(n-1)

Write a function for Cindy's Massage using *C(t)*

C(t)= 60+25(n-1)

At how many hours will Cindy's Massage be cheaper?

Example 4- Find the formulas for a_n and b_n for the two arithmetic sequences below.

$a_n = 0, 35, 70, \ldots$ (+35)

$a_n = 0 + 35(n-1)$

$b_n = 35, 60, 85, \ldots$ (+25)

$b_n = 35 + 25(n-1)$

Find :

$a_4 = 0 + 35(4-1)$

$a_4 = 105$

$b_4 = 35 + 25(4-1)$

$a_4 = 110$

Find the domain and range of the following

1. $$f(x) = \frac{3x}{x^2 + 2x - 8}$$

2. $$g(x) = \frac{x}{2x^2 + 5x - 36}$$

3. $$h(x) = \frac{1}{3x^2 + 10x + 3}$$

Find the formula for the n^{th} term of the arithmetic sequence

4. $$a_n = 51\ ,\ 41\ ,\ 31\ \ldots$$

5. $$a_1 = 154 \qquad a_2 = 141$$

6. $$a_7 = 117 \qquad a_{13} = 153$$

How do we determine if a sequence is Geometric?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 7, Lesson 3
1. Warm-up
2. Geometric Sequences
3. ICA
4. Independent Work

Geometric Sequences
How do we determine if a sequence is Geometric?

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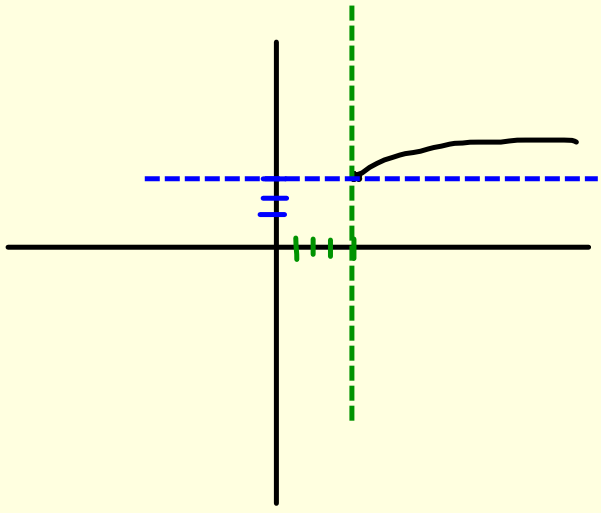
Warm-up: Find the domain and range of the following function

$$f(x) = \sqrt{2x - 8} + 3$$

Domain: $x \mid x \geq 4$

Range: $y \mid y \geq 3$



Notes Notes

Standard 1.8

Geometric Sequences

Geometric Sequences- A pattern of numbers where we *MULTIPLY* the same number to find the next term

i.e. 2 , 4 , 8 , 16 , ...

•2 •2 •2

i.e. 3 , -12 , 48 , -192 , ...

•(–4) •(–4) •(–4)

Common Ratio- The number that is being multiplied to find the next term

n^{th} term of a Geometric Sequence:

$$a_n = a_1 \cdot r^{(n-1)}$$

a_1: 1st term; r: common ratio; n: term you are looking for

Standard 1.8

Geometric Sequences

Example 1- Given the geometric sequence, find the common rati
a_n, a_5, and a_{12} term of the sequence

$a_n = 3, 15, 75, 375, \ldots$

x5 x5 x5

r: x5

$a_n = 3 \cdot 5^{(n-1)}$

$a_5 = 3 \cdot 5^{(5-1)}$ $a_{12} = 3 \cdot 5^{(12-1)}$

a_5= 1,875 a_{12}= 146,484,375

Example 2- Consider the geometric sequence

4.5 , 9 , a , 36 , b , ...

x2

r: x2

$a_n = 4.5(2^{(n-1)})$

$a = 18$ $b = 72$

Example 3- In a geometric sequence, $a_3 = 8$ and $a_6 = 64$.

Find the common ratio and a_{10}

$r =$ x2 $a_{10} = 1024$

$\frac{2}{a_1}$ $\frac{4}{a_2}$ $\frac{8}{a_3}$ $\frac{16}{a_4}$ $\frac{32}{a_5}$ $\frac{64}{a_6}$

x2 x2 x2

Summary:

Let's compare the geometric sequence to the arithmetic sequence below. When will each sequence have a value of 384?

$$g_n = 1.5 \bullet 2^{n-1} \qquad a_n = 52 + 4(n-1)$$

Find the given term in each sequence. Use the answers to solve the riddle.

1. 12th term: 3, 6, 12, 24, 48 ... **T**
2. 8th term: 1, 4, 16, 64, 256 ... **S**
3. 9th term: -4, -2, 0, 2, 4 ... **F**
4. 6th term: 1/2, 1, 2, 4 ... **E**
5. 7th term: 3, 6, 12, 24 ... **L**
6. 5th term: 1, 1.5, 2.25, 3.375 ... **C**
7. 10th term: 1/3, -1/3, 1/3, -1/3, 1/3...
8. 6th term: 96, 48, 24, 12, 6 ... **A**
9. 10th term: 5, -5, 5, -5, 5 ... **R**
10. 6th term: 1, 2, 4, 8 ... **M**

Where should you never take a dog?

To a

12	192	16	3	32	3	−5	$-\frac{1}{3}$	16	6144

How does a geometric sequence change when it is decreasing?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 7, Lesson 4

1. Warm-up
2. Decreasing Geometric Sequences
3. ICA

Decreasing Geometric Sequences

How does a geometric sequence change when it is decreasing?

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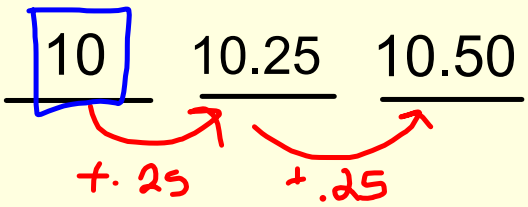
Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up:

A teenager puts $10.00 into his savings account. One week later, he puts $10.25 in the bank. Two weeks later, he puts $10.50 in the bank and so on. How much money does he put the bank on the 25^{th} week.



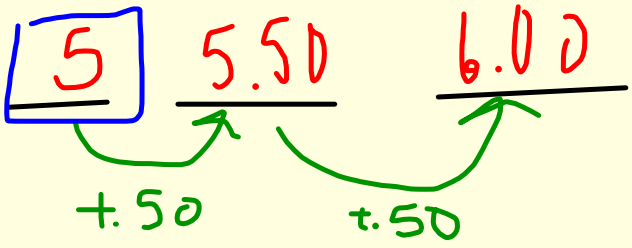
$10+0.25(n-1)$

$10+0.25(25-1)$

He will deposit $16 to the bank on the 25th week.

Warm-up:

A teenager puts $5.00 into his savings account. One week later, he puts $5.50 in the bank. Two weeks later, he puts $6.00 in the bank and so on. How much money does he put in the bank on the 22ndweek.



$5 + .5(n-1)$

$5 + .5(22-1)$

$15.50

Standard 1.8

Decreasing Geometric Sequences

= nth term

Look at the sequence below. Try and find the explicit formula for the geometric sequence

120 , 80 , 53.3 , 35.5 , 23.7 , ...

$\times \frac{2}{3}$ $\times \frac{2}{3}$ $\times \frac{2}{3}$ $\times \frac{2}{3}$

$$a_n = 120\left(\frac{2}{3}\right)^{(n-1)}$$

If a geometric sequence is decreasing, then the common ratio is between -1 and 1

i.e.- 8 , -4 , 2 , -1 , ...

$\cdot\left(-\frac{1}{2}\right)$ $\cdot\left(-\frac{1}{2}\right)$ $\cdot\left(-\frac{1}{2}\right)$

Example 1- Find the explicit formula for a geometric sequence given the following information

$a_5 = 125$ $a_8 = 1$

78125 , 15625 , 3125 , 625 , 125 , 25 , 5 , 1

a_1 a_2 a_3 a_4 a_5 a_6 a_7 a_8

$\times \frac{1}{5}$ $\div 5$

$$a_n = 78125\left(\frac{1}{5}\right)^{(n-1)}$$

Summary:

Find the values of a_1 and r.

4, 2, 1, 0.5, 0.25, ...

108, 36, 12, 4, 4/3 ...

Find the next three terms of each sequence.

3, 6, 12, 24, . . .

225, 45, 9, 1.8, . . .

-80, 20, -5, 1.25, . . .

-3, -12, -48, -192, . . .

Determine whether each sequence is arithmetic or geometric.

2, 14, 98, 686, . . .

12, 8, 4, 0, . . .

Find the a_{150} of the following arithmetic sequence

18 , 12 , 6 , 0 , …

Find the explicit formula for the following geometric sequence

1.5 , 3 , 6 , 12 , …

Find the explicit formula for an arithmetic sequence given the following information

$a_3 = 18$ $a_5 = 26$

Find the explicit formula and the 9^{th} term of the geometric sequence below

400 , 200 , 100 , …

Find the explicit formula for a geometric sequence given the following

$a_2 = 6$ $a_5 = 20.25$

Find the common ratio of a sequence if

$a_6 = 42$ and $a_9 = 4.67$

Find the common difference of a sequence given the following:

$a_5 = 92$ and $a_9 = 114$

Find the explicit formula of a geometric sequence given the following, then find a_5

$a_1 = 6$ $a_2 = 3$

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<u>Test Like Question</u>

For a geometric sequence, $a_4 = 16$ and $a_8 = 1$

Find the common ratio $r =$

Find the explicit formula $a_n =$

Find a_6 $a_6 =$