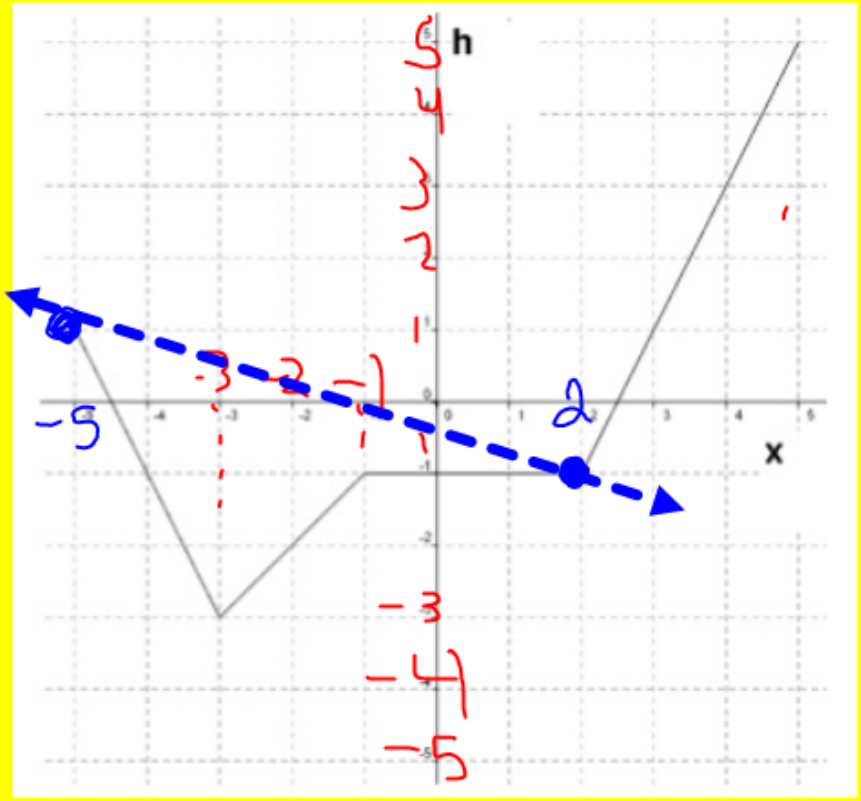
Warmup:

Identify all of the key features of this graph below.

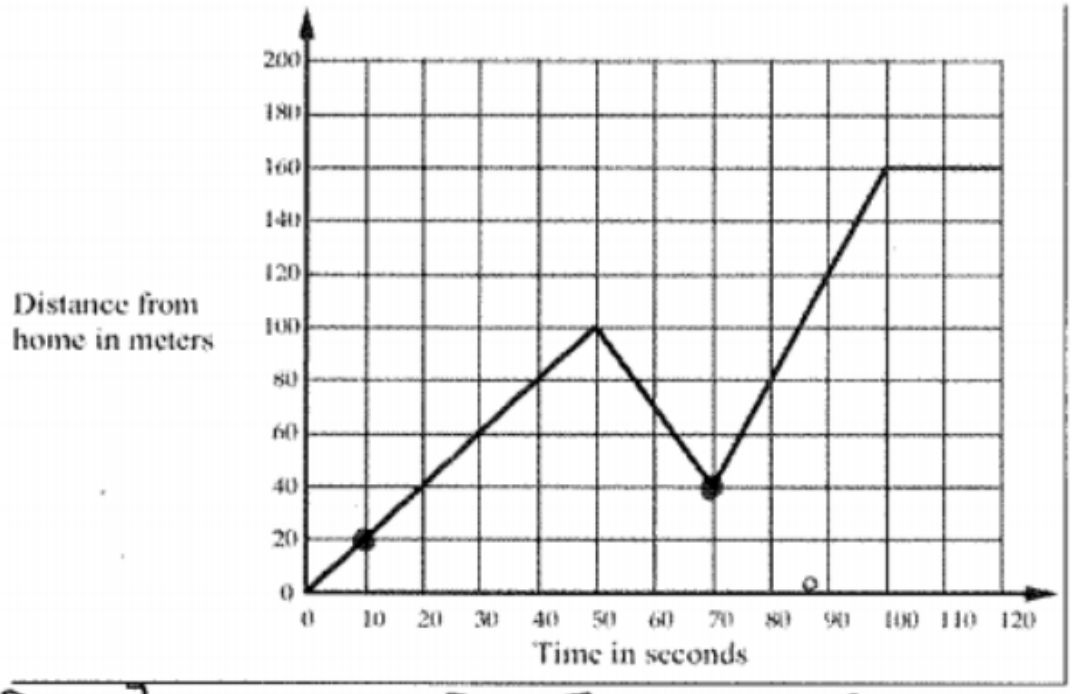


- x - intercept ✓ 2.5 & -4.8
- y - intercept ✓ -1
- increasing ✓ (-3, -1) & (2, 5)
- decreasing (-5, -3) ✓
- positive [-5, -4.8) & (2.5, 5]
- negative (-4.8, 2.5)
- maximum ✓ Abs = 5 ✓ Rel = 1
- minimum ✓ Abs = -3 Rel = N/A
- avg. rate of change from $\frac{\Delta y}{\Delta x} = \frac{-2}{7}$ ✓
  x = -5 to x = 2

HW #10 Answer Key

Identify all of the key characteristics of each of the graphs below.

#1)



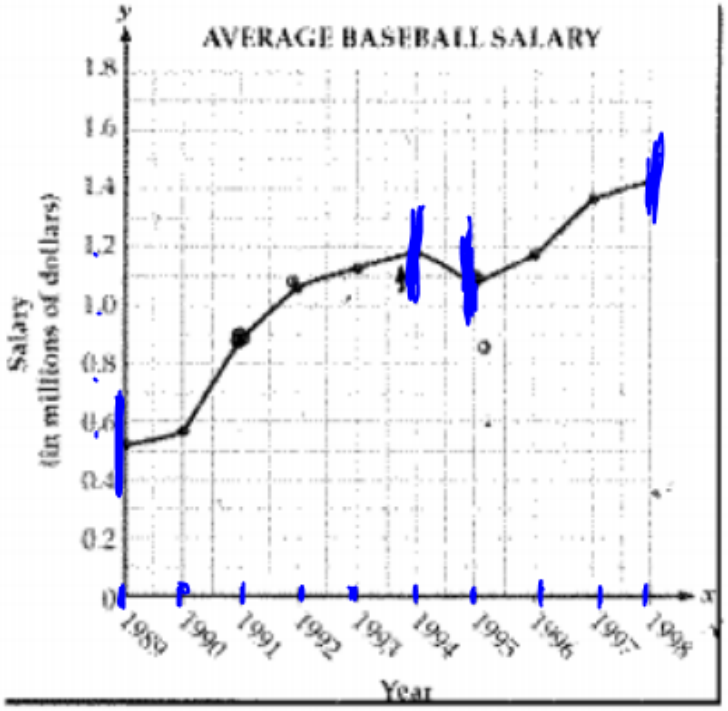
Domain: $[0,120]$ Range: $[0,160]$ x-int: $(0,0)$ y-int: $(0,0)$

increasing: $(0,50)$ $(70,100)$ decreasing: $(50,70)$ positive: $(0,120]$ negative: N/A

maximums: 100 (rel) & 160 (abs) minimums: 0 (abs) & 40 (rel) average rate of change from x = 10 to x = 70

$\frac{20}{60} = \frac{1}{3}$

#2)



Domain: [1989, 1998] Range: [.5, 1.4] x-int: N/A y-int: (0, .5)

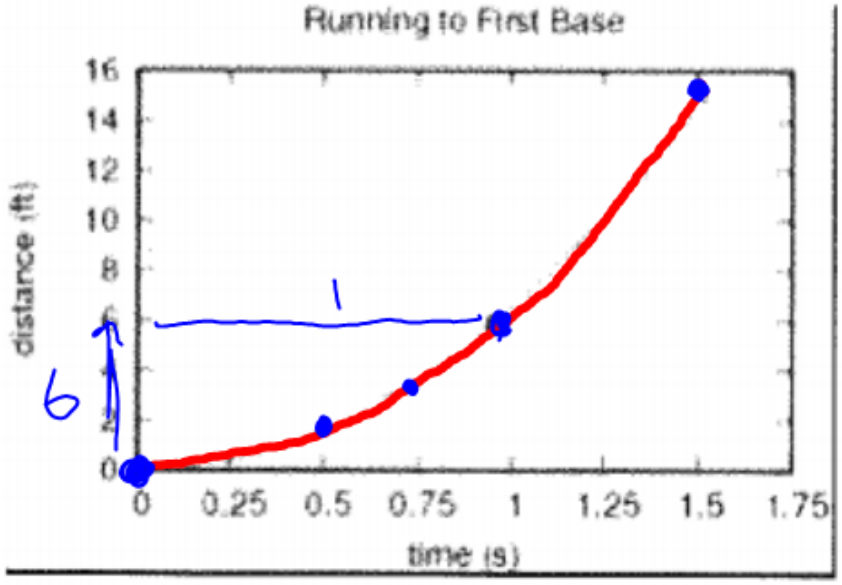
increasing: (1989, 1994) (1995, 1998) decreasing: (1994, 1995) positive: (1989, 1998) negative: N/A

maximums: 1.2 rel & 1.4 abs minimums: .5 abs & 1.1 rel

avg. rate of change from x = 1991 to x = 1995

$\frac{.2}{4} = .05$

#3)



Domain: $[0, 1.5]$ Range: $[0, 15]$ x-int: $(0, 0)$ y-int: $(0, 0)$

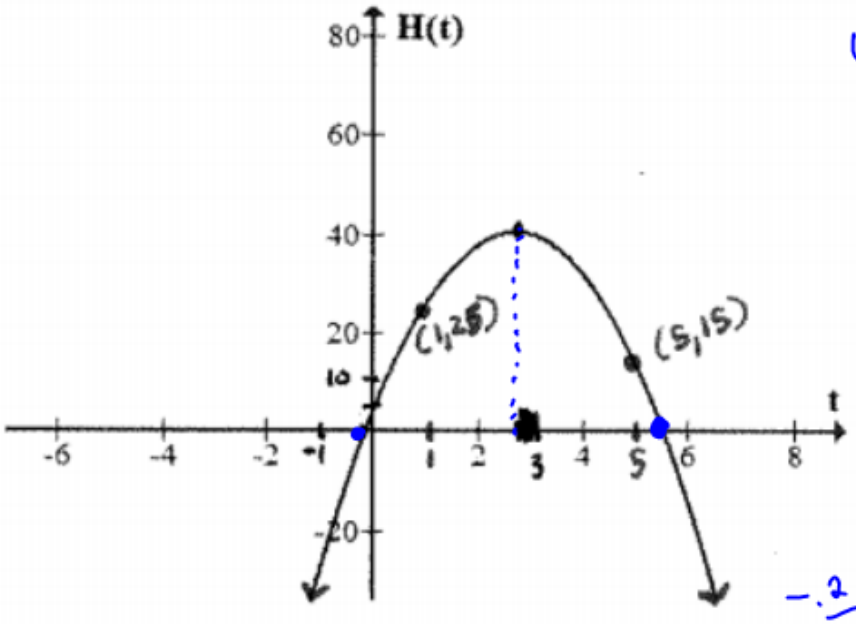
increasing: $(0, 1.5)$ decreasing: N/A positive: $(0, 1.5)$ negative: N/A

maximums: 15 abs N/A: rel minimums: 0 abs N/A: rel

average rate of change from $x = 0$ to $x = 1$

$\frac{6}{1} = 6$

#4)



Unit 3
Quadratics

$\{-2, 5.5\}$

$-.2 \leq 5.5$

Domain: $(-\infty, \infty)$

Range: $(-\infty, 40]$

x-int: $(-.2, 0)$ $(5.5, 0)$

y-int: $(0, 5)$

increasing: $(-\infty, 3)$

decreasing: $(3, \infty)$

positive: $(-2, 5.5)$

negative: $(-\infty, -.2)$ $(5.5, \infty)$

maximums:

40

minimums:

N/A

average rate of change from x = 1 to x = 5

$$\frac{-10}{4} = -2.5$$

E.Q.:

Why are sequences functions?

How do I write recursive and explicit formulas for arithmetic sequences?

ARITHMETIC SEQUENCES

Find the next two terms of each sequence and then describe the pattern.

1, 3, 5, 7, 9, 11, 13 — Description: adding 2 to the previous term.

2, 7, 12, 17, 22, 27, 32 — Description: adding 5 to the previous term.

-416, -323, -230, -137, -44, 49 — Description: adding 93 to the previous term.

-2, -5, -8, -11, -14, -17 — Description: ~~subtracting 3~~ adding −3 to the previous term.

$-5 - -2 = -3$

$-416 - -323 = -93$

$-323 - -416 = +93$

$-323 - -230 = -93$

$-230 - -323 = +93$

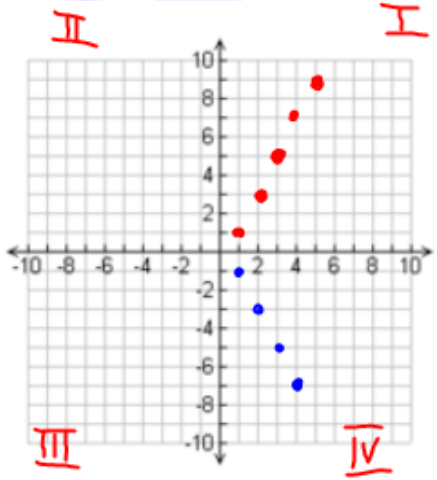
subtract consecutive terms.

All of the previous patterns are called arithmetic sequences. Hopefully you noticed something about their pattern that makes them similar. Complete the sentence below by writing a description of the pattern you noticed above.

Arithmetic sequences are sequences of numbers where we add (or subtract) a constant value to the previous term to continue our sequence.

Let's look more closely at the first pattern 1, 3, 5, 7, 9... Suppose the domain is the *position* of a term (1, 2, 3, 4, etc.) and the range *is the term* (1, 3, 5, 7, 9, etc.).

Make a graph of the points that are made (position, term) with the pattern.



What quadrant(s) are these points in? Why?

Quad. I (Quad IV)

What kind of graph do you have? Linear

Write an equation for the graph. $y = 2x - 1$

How does this equation relate to the graph? How does this equation relate to the pattern?

Equation would match all of points

Do you think the graphs of other arithmetic sequences would look similar? Yes Why or why not? Constant Rate of Change.

term #	actual term
0	-1
1	1 (+2)
2	3 (+2)
3	5
4	7

$y = 2x - 1$

$y = mx + b$

$-1, -3, -5, -7, \ldots$

Find the three terms in the sequence after the last one given.

1) 24, 21, 18, 15, ... 12, 9, 6

adding −3

2) 32, 25, 18, 11, ... 4, −3, −10

adding −7

25 − 32 = −7

18 − 25 = −7

3) −31, −37, −43, −49, ... −55, −61, −67

adding −6

4) 18, −182, −382, −582, ... ~~−746~~, ~~−910~~, −1024

−782, −982, −1182

adding −200

−182 − 18 = −200

−382 − −182 = −200

An **arithmetic sequence** is a sequence where the difference between consecutive terms is *constant*.

(linear function)

$y = mx + b$ $\quad a_0 = y\text{-int}$

d is the same as the slope.

The difference between consecutive terms of an arithmetic sequence is called the **common difference.** (d)

Writing Arithmetic Sequences

Recursive Formula

$$\begin{cases} a_1 = \text{value of 1st term} \\ a_n = a_{n-1} + d \end{cases}$$

Put #'s in for "d"

"value of 1st term"

Explicit Formula

$\star\ a_n = d \cdot n + a_0\ \star$

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

Identifying Arithmetic Sequences

Is the sequence arithmetic?
How do you know?

"Unit 4"

Geometric

3, 6, 9, 12, 15, ...

Yes!

adding 3

2, 4, 8, 16, 32, ...

No

mult. 2

Writing and Using Formulas for Arithmetic Sequences

Given the arithmetic sequence -3, -1, 1, 3, ...

-5 $\{-3, -1, 1$
a_0 a_1 a_2 a_3

a) write a recursive formula for the sequence.

$$\begin{cases} a_1 = -3 \\ a_n = a_{n-1} + 2 \end{cases}$$

b) write an explicit formula for the sequence

$a_n = dn + a_0$

$$a_n = 2n + -5$$

c) what is the 56th term of the sequence?

$a_{56} = 2(56) + -5$

$a_{56} = 107$

Given the arithmetic sequence 10, 5, 0, -5, ...

a) write a recursive formula for the sequence.

b) write an explicit formula for the sequence

c) what is the 20th term of the sequence?

What are the second and third terms of the sequence
100, _____, _____, 82, ... ?

Using Arithmetic Sequences to Solve Problems

Over the last ten years, the amount of snow a town received formed an arithmetic sequence. If 21 inches of snow fell 10 years ago and 19 inches fell 9 years ago, how many inches fell 2 years ago?
Explain.

Practice with Sequences

HW #11

Arithmetic Sequences