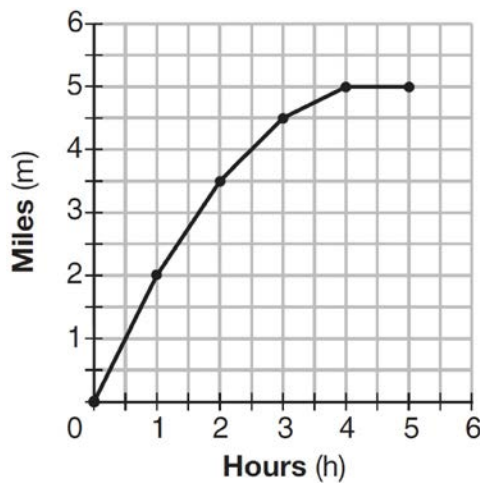


F.IF.B.6: Rate of Change 1

1 An astronaut drops a rock off the edge of a cliff on the Moon. The distance, $d(t)$, in meters, the rock travels after t seconds can be modeled by the function $d(t) = 0.8t^2$. What is the average speed, in meters per second, of the rock between 5 and 10 seconds after it was dropped?

- 1) 12
- 2) 20
- 3) 60
- 4) 80

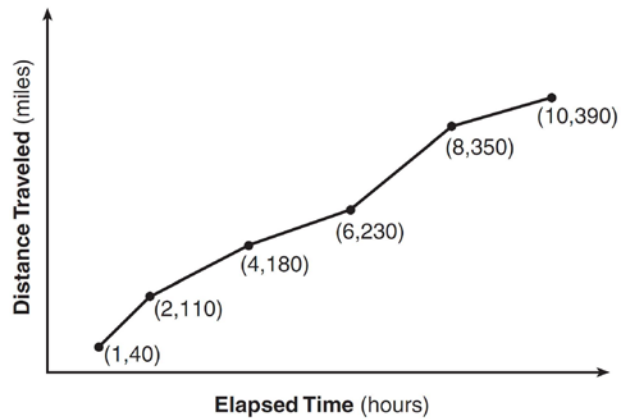
2 The graph below shows the distance in miles, m , hiked from a camp in h hours.



Which hourly interval had the greatest rate of change?

- 1) hour 0 to hour 1
- 2) hour 1 to hour 2
- 3) hour 2 to hour 3
- 4) hour 3 to hour 4

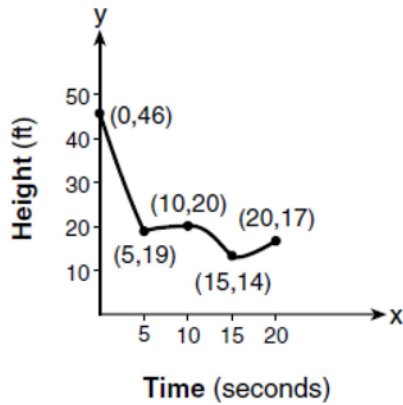
3 The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.



During which interval was their average speed the greatest?

- 1) the first hour to the second hour
- 2) the second hour to the fourth hour
- 3) the sixth hour to the eighth hour
- 4) the eighth hour to the tenth hour

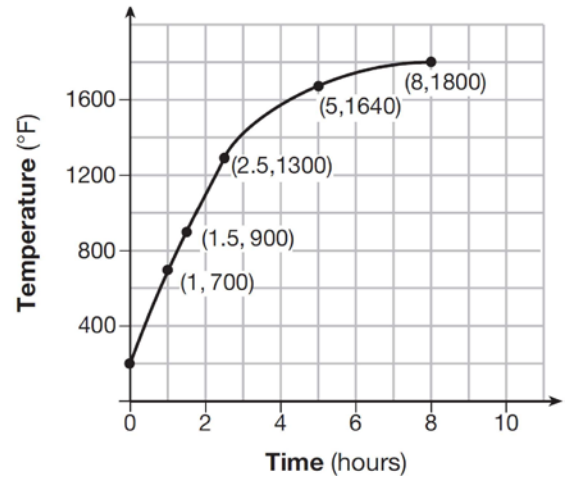
- 4 The graph below models the height of a remote-control helicopter over 20 seconds during flight.



Over which interval does the helicopter have the *slowest* average rate of change?

- 1) 0 to 5 seconds
- 2) 5 to 10 seconds
- 3) 10 to 15 seconds
- 4) 15 to 20 seconds

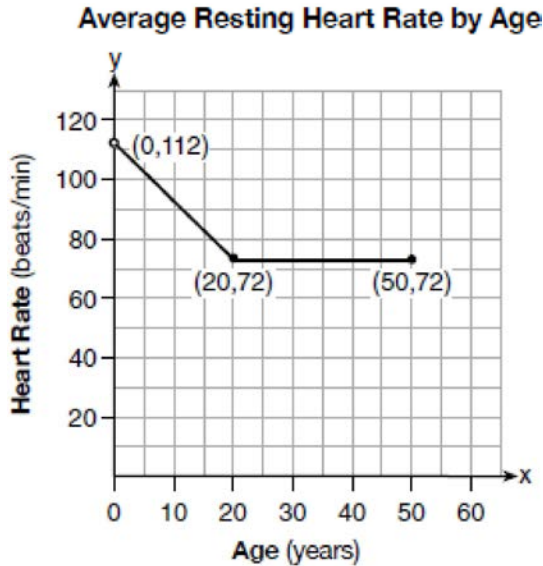
- 5 Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.



During which time interval did the temperature in the kiln show the greatest average rate of change?

- 1) 0 to 1 hour
- 2) 1 hour to 1.5 hours
- 3) 2.5 hours to 5 hours
- 4) 5 hours to 8 hours

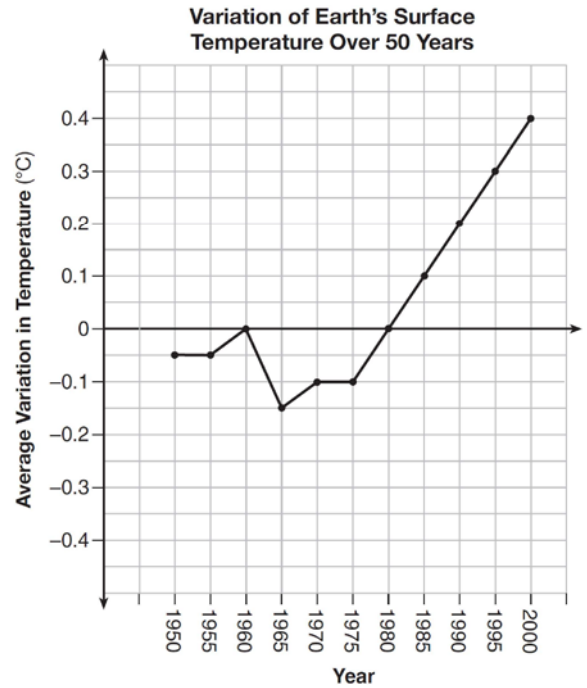
- 6 A graph of average resting heart rates is shown below. The average resting heart rate for adults is 72 beats per minute, but doctors consider resting rates from 60-100 beats per minute within normal range.



Which statement about average resting heart rates is *not* supported by the graph?

- 1) A 10-year-old has the same average resting heart rate as a 20-year-old.
- 2) A 20-year-old has the same average resting heart rate as a 30-year-old.
- 3) A 40-year-old may have the same average resting heart rate for ten years.
- 4) The average resting heart rate for teenagers steadily decreases.

- 7 The graph below shows the variation in the average temperature of Earth's surface from 1950-2000, according to one source.



During which years did the temperature variation change the most per unit time? Explain how you determined your answer.

- 8 The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

- 1) 2.4
 - 2) 0.04
 - 3) -2.4
 - 4) -0.04
- 9 Joey enlarged a 3-inch by 5-inch photograph on a copy machine. He enlarged it four times. The table below shows the area of the photograph after each enlargement.

Enlargement	0	1	2	3	4
Area (square inches)	15	18.8	23.4	29.3	36.6

What is the average rate of change of the area from the original photograph to the fourth enlargement, to the nearest tenth?

- 1) 4.3
- 2) 4.5
- 3) 5.4
- 4) 6.0

- 10 A family is traveling from their home to a vacation resort hotel. The table below shows their distance from home as a function of time.

Time (hrs)	0	2	5	7
Distance (mi)	0	140	375	480

Determine the average rate of change between hour 2 and hour 7, including units.

- 11 The table below shows the year and the number of households in a building that had high-speed broadband internet access.

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?

- 1) 2002 - 2004
 - 2) 2003 - 2005
 - 3) 2004 - 2006
 - 4) 2005 - 2007
- 12 The table below shows the cost of mailing a postcard in different years. During which time interval did the cost increase at the greatest average rate?

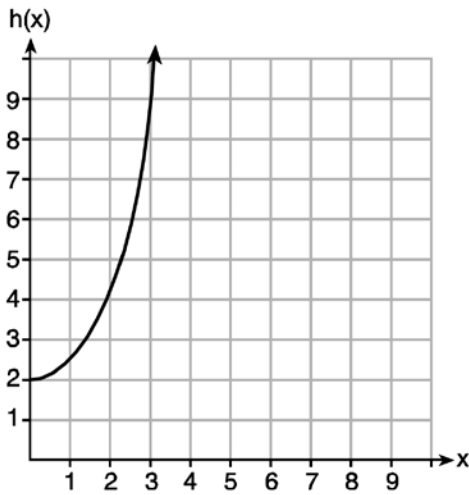
Year	1898	1971	1985	2006	2012
Cost (¢)	1	6	14	24	35

- 1) 1898-1971
- 2) 1971-1985
- 3) 1985-2006
- 4) 2006-2012

- 13 Given the functions $g(x)$, $f(x)$, and $h(x)$ shown below:

$$g(x) = x^2 - 2x$$

x	f(x)
0	1
1	2
2	5
3	7



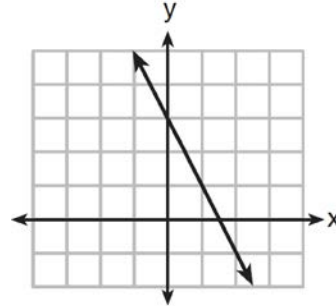
The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \leq x \leq 3$ is

- 1) $f(x)$, $g(x)$, $h(x)$
- 2) $h(x)$, $g(x)$, $f(x)$
- 3) $g(x)$, $f(x)$, $h(x)$
- 4) $h(x)$, $f(x)$, $g(x)$

- 14 Which function has a constant rate of change equal to -3 ?

x	y
0	2
1	5
2	8
3	11

- 1)
- 2) $\{(1,5), (2,2), (3,-5), (4,4)\}$



- 3)
- 4) $2y = -6x + 10$

F.IF.B.6: Rate of Change 1**Answer Section**

1 ANS: 1

$$\frac{0.8(10^2) - 0.8(5^2)}{10 - 5} = \frac{80 - 20}{5} = 12$$

REF: 011521ai

2 ANS: 1

The graph is steepest between hour 0 and hour 1.

REF: 081601ai

3 ANS: 1

$$\frac{110 - 40}{2 - 1} > \frac{350 - 230}{8 - 6}$$

$$70 > 60$$

REF: 061418ai

4 ANS: 2

The slope of a line connecting (5,19) and (10,20) is lowest.

REF: 081705ai

5 ANS: 1

REF: 081515ai

6 ANS: 1

REF: 011721ai

7 ANS:

During 1960-1965 the graph has the steepest slope.

REF: 011628ai

8 ANS: 4

$$\frac{4.7 - 2.3}{20 - 80} = \frac{2.4}{-60} = -0.04.$$

REF: 081414ai

9 ANS: 3

$$\frac{36.6 - 15}{4 - 0} = \frac{21.6}{4} = 5.4$$

REF: 061511ai

10 ANS:

$$\frac{480 - 140}{7 - 2} = 68 \text{ mph}$$

REF: 011731ai

11 ANS: 1

REF: 061603ai

12 ANS: 4

$$(1) \frac{6-1}{1971-1898} = \frac{5}{73} \approx .07 \quad (2) \frac{14-6}{1985-1971} = \frac{8}{14} \approx .57 \quad (3) \frac{24-14}{2006-1985} = \frac{10}{21} \approx .48 \quad (4) \frac{35-24}{2012-2006} = \frac{11}{6} \approx 1.83$$

REF: 011613ai

13 ANS: 4

Over the interval $0 \leq x \leq 3$, the average rate of change for $h(x) = \frac{9-2}{3-0} = \frac{7}{3}$, $f(x) = \frac{7-1}{3-0} = \frac{6}{3} = 2$, and

$$g(x) = \frac{3-0}{3-0} = \frac{3}{3} = 1.$$

REF: spr1301ai

14 ANS: 4

$$1) y = 3x + 2; 2) \frac{-5-2}{3-2} = -7; 3) y = -2x + 3; 4) y = -3x + 5$$

REF: 081615ai