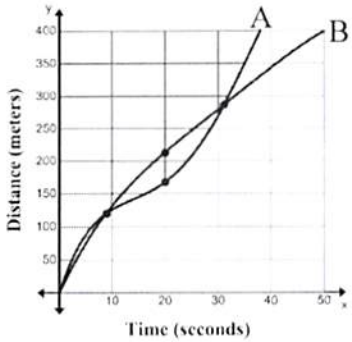
Rate of Change Practice Worksheet

Name Key Class Period

Below is the graph and table for 2 runners running the 400 meter hurdles race.



Time	Runner A	Runner B
0	0	0
9	120	120
20	168	213
31	287	287

1. Which runner has a faster average speed for the first 9 seconds?

A: $\frac{120}{9} = 13.\overline{3}$ B: $\frac{120}{9} = 13.\overline{3}$ Neither - same speed

2. Which runner has a faster average speed from 9 to 20 seconds?

A: $\frac{168-120}{20-9} = \frac{48}{11} = 4.4$ B: $\frac{213-120}{20-9} = \frac{93}{11} = 8.5$ Runner B

3. Which runner has a faster average speed from 20 to 31 seconds?

A: $\frac{287-168}{31-20} = \frac{119}{11} = 10.8$ B: $\frac{287-213}{31-20} = \frac{74}{11} = 6.7$ Runner A

4. Which runner has a faster average speed from 9 to 31 seconds?

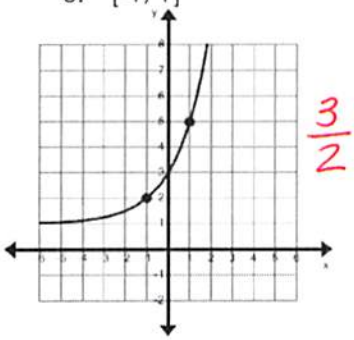
A: $\frac{287-120}{31-9} = \frac{167}{22} = 7.6$ B: $\frac{287-120}{31-9} = \frac{167}{22} = 7.6$ Neither - same speed

5. Which runner wins the race? How do you know?

Runner A - from graph - finishes in less time

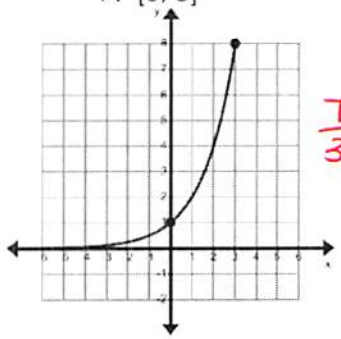
Find the average rate of change for each of the following graphs over the given interval.

6. [-1, 1]



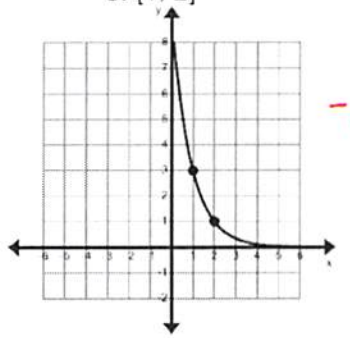
$\frac{3}{2}$

7. [0, 3]



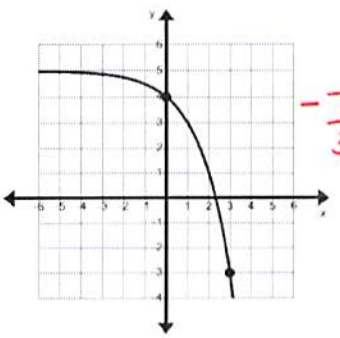
$\frac{7}{3}$

8. [1, 2]



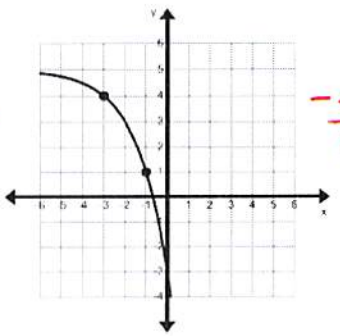
-2

9. [0, 3]



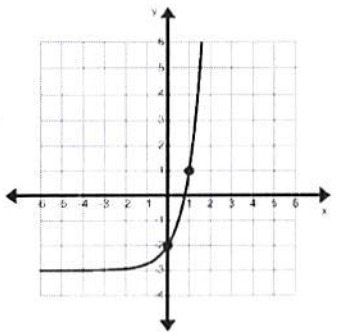
$-\frac{7}{3}$

10. [-3, -1]



$-\frac{3}{2}$

11. [0, 1]



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Solutions - Rate of Change Practice Worksheet

1. Neither - both runners cover 120 meters in 9 seconds. (using table)

2. Runner B runs 93 meters in the same time that Runner A runs 48 meters. So Runner Be has a faster average speed. (using table)

3. Runner A runs 119 meters in the same time that Runner B runs 74 meters. So Runner A has a faster average speed. (using table)

4. Neither - both runners cover 167meters in 22 seconds. (using table)

5. Runner A wins the race because you can see from the graph that Runner A finishes running 400 meters in less time than Runner B. (using graph)

Solutions - Rate of Change Practice Worksheet

⑥ $(-1, 2), (1, 5)$

$$\frac{5-2}{1-(-1)} = \boxed{\frac{3}{2}}$$

⑦ $(0, 1), (3, 8)$

$$\frac{8-1}{3-0} = \boxed{\frac{7}{3}}$$

⑧ $(1, 3), (2, 1)$

$$\frac{1-3}{2-1} = \frac{-2}{1} = \boxed{-2}$$

⑨ $(0, 4), (3, -3)$

$$\frac{-3-4}{3-0} = \boxed{\frac{-7}{3}}$$

⑩ $(-3, 4), (-1, 1)$

$$\frac{1-4}{-1-(-3)} = \frac{-3}{-1+3}$$

$$= \boxed{\frac{-3}{2}}$$

⑪ $(0, -2), (1, 1)$

$$\frac{1-(-2)}{1-0} = \frac{1+2}{1}$$

$$= \frac{3}{1} = \boxed{3}$$

Suppose 25 flour beetles are left undisturbed in a warehouse bin. The beetle population doubles in size every week. The equation $P(x) = 25 \cdot 2^x$ can be used to determine the number of beetles after x weeks. Complete the table.

Week	Population
0	25
1	50
2	100
3	200
4	400
5	800

12. Calculate the average growth rate between weeks 1 and 3.

$$\frac{200-50}{3-1} = \frac{150}{2} = \boxed{75}$$

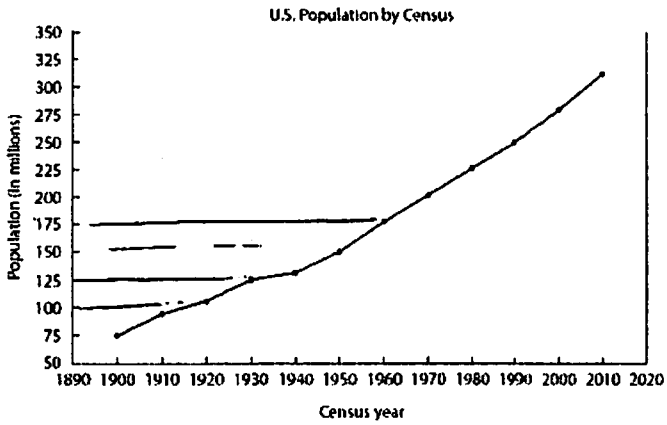
13. Calculate the average growth rate for the first five weeks [0, 5].

$$\frac{800-25}{5-0} = \frac{775}{5} = \boxed{155}$$

14. Which average growth rate is higher? Why do you think it is higher?

The growth rate for the first five weeks. Greater values included since data is doubling

The graph below shows the United States population from 1900 to 2010, as recorded by the U.S. Census Bureau.



15. What was the rate of change in the population from 1900 to 2000? Is this greater or less than the rate of change in the population from 2000 to 2010?

(1900, 75), (2000, 280) (2000, 280), (2010, 315) Less Than

$$\frac{280-75}{2000-1900} = \frac{205}{100} = 2.05 \qquad \frac{315-280}{2010-2000} = \frac{35}{10} = 3.5$$

16. Which 10-year time periods have the highest and the lowest rates of change? How did you find these? Looked at graph

Lowest: 1910-1920, 1930-1940

Highest: 1950-1960, 1960-1970, 1970-1980, 1980-1990, 1990-2000, 2000-2010

Find the rate of change of Pete's height from 3 to 5 years.

17.

Time (years)	1	2	3	4	5	6
Height(in.)	27	35	37	42	45	49

$$\frac{45-37}{5-3} = \frac{8}{2} = \boxed{4}$$

For $f(x) = x^2 - 2$, find the rate of change on the interval [-2, 4]. (-2, 2), (4, 14)

18. $f(-2) = 4 - 2 = 2$

$f(4) = 16 - 2 = 14$

$$\frac{14-2}{4-(-2)} = \frac{12}{6} = \boxed{2}$$