HW 5.3.1: How Fast is *y* Changing?

1. Use the graph in Fig. 12 to fill in the table.

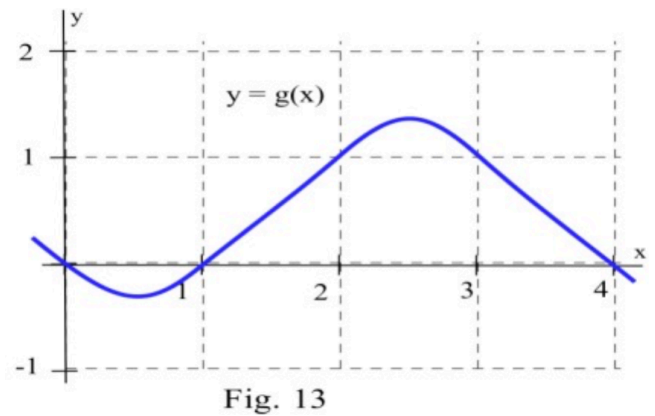| x	y=f(x)
0	
0.5	
1	
1.5	
2	
2.5	
3	
3.5	
4	

Fig. 12

How fast is *y* changing at each of the listed values:

   a. x = 1

   b. x = 2
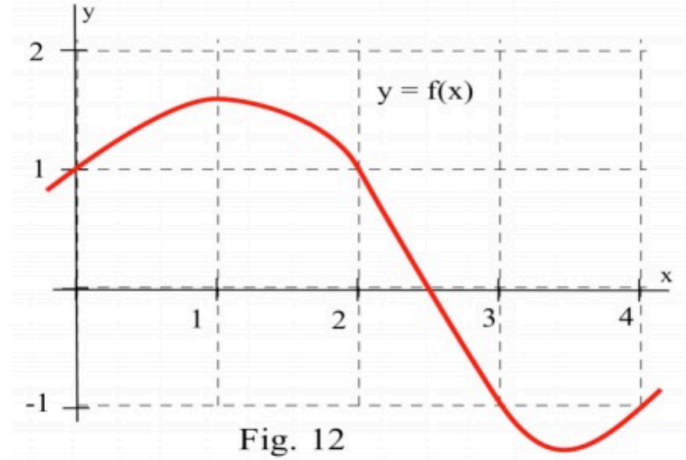
   c. x = 3

2. Use the graph in Fig. 13 to fill in the table.

x	y=g(x)
0	
0.5	
1	
1.5	
2	
2.5	
3	
3.5	
4	

Fig. 13

How fast is *y* changing at each of the listed values:

   a. x = 1

   b. x = 2

   c. x = 3

3. What connection do you notice between how fast *y* is changing and the graph at that point?

4. The table below gives the annual sales (in millions of dollars) of a product. What was the average rate of change of annual sales
   a) between 2000 and 2001?   b) between 2000 and 2005?

year	1998	1999	2000	2001	2002	2003	2004	2005	2006
sales	207	220	235	245	247	252	250	243	237

5. The table below gives the population of a city, in thousands. What was the average rate of change of population
   a) between 2002 and 2004?   b) between 2002 and 2006?

year	2000	2001	2002	2003	2004	2005	2006	2007	2008
population	185	187	182	181	178	176	177	175	182

6. Based on the graph shown, estimate the average rate of change from $x = 0$ to $x = 3$.
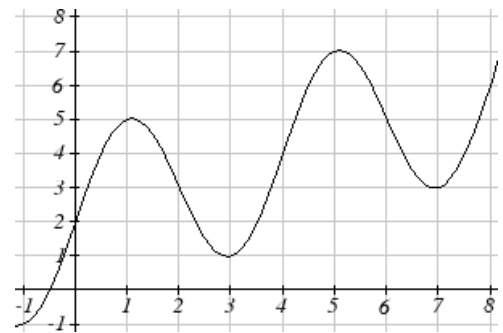
7. Based on the graph shown, estimate the average rate of change from $x = 1$ to $x = 5$.

Find the average rate of change of each function on the interval specified.

8. $f(x) = x^2$ on [2, 5]

9. $q(x) = x^3$ on [-1, 3]

10. $g(x) = 2x^3 - 1$ on [-3, 3]

11. $h(x) = 3 - 5x^2$ on [-2, 4]

12. $k(t) = 4t^2 + \dfrac{2}{t^3}$ on [-1, 3]

13. $r(t) = \dfrac{t^3 - 2t + 1}{t^3 + 2}$ on [-3, 1]

Find the average rate of change of each function on the interval specified. Your answers will be expressions involving a parameter (a or h).

14. $f(x) = 3x^2 + 1$ on $[1, a]$

15. $g(x) = 4x^2 - 5$ on $[3, a]$

16. $h(x) = 3x + 4$ on $[2, 2+h]$

17. $k(x) = 4x - 2$ on $[3, 3+h]$

18. $p(t) = \dfrac{1}{t+2}$ on $[9, 9+h]$

19. $r(t) = \dfrac{3}{t+1}$ on $[1, 1+h]$

20. $j(x) = 3x^3$ on $[2, 2+h]$

21. $l(x) = 4t^3$ on $[0, h]$

22. $m(x) = 2x^2 - 3$ on $[x, x+h]$

23. $n(x) = x^2 - 7$ on $[x, x+h]$

Selected Answers:

1. (answers may vary) a. 0   b. -1.25   c. -1.25
3. Appears that the slope at the point is really close to how fast y is changing.
9. 7
15. 4(a+3)