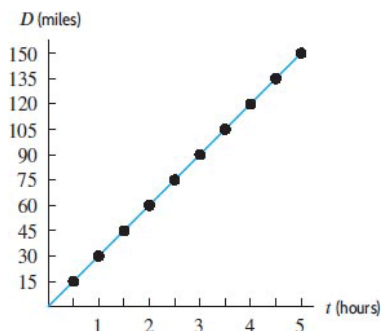


## Section 1.2: Rate of Change

1. The table below shows the temperature,  $T$ , in Tuscon, Arizona  $t$  hours after midnight. When does the temperature decrease the fastest: between midnight and 3 a.m. or between 3 a.m. and 4 a.m.?

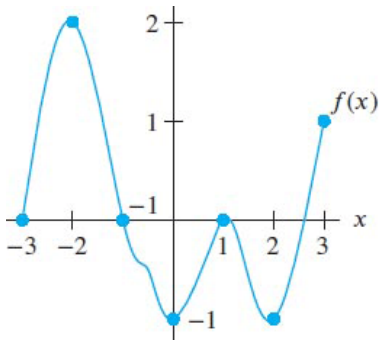
$t$ (hours after midnight)	0	3	4
$T$ (temp. in °F)	85	76	70

2. In 2007, you had 40 songs in your favorite iTunes playlist. In 2010, you had 120 songs. In 2014, you had 40. What was the average rate of change per year in the number of songs in your favorite iTunes playlist between
- (a) 2007 and 2010?
  - (b) 2010 and 2014?
  - (c) 2007 and 2014?
3. The graph below shows distance traveled as a function of time.



- (a) Find  $\Delta D$  and  $\Delta t$ , and then compute the rate of change,  $\Delta D/\Delta t$ , over each of the intervals:
- i.  $t = 2$  and  $t = 5$
  - ii.  $t = 0.5$  and  $t = 2.5$
  - iii.  $t = 1.5$  and  $t = 3$
- (b) Interpret the results of part (a).

4. Use the graph below to answer the following questions.



- (a) Find the average rate of change of  $f$  for  $1 \leq x \leq 3$ .
  - (b) Find the average rate of change of  $f$  for  $-3 \leq x \leq -2$ .
  - (c) Find the average rate of change of  $f$  for  $-3 \leq x \leq 1$ .
  - (d) In general, when is a function considered to be increasing? Decreasing?
  - (e) For this function, on which intervals is the function increasing? Decreasing?
5. Let  $f(x) = 4 - x^2$ .
- (a) Find  $f(0)$  and  $f(2)$ . What is the average rate of change of  $f(x)$  on the interval  $0 \leq x \leq 2$ ?
  - (b) Find the average rate of change of  $f(x)$  on the interval  $2 \leq x \leq 4$ .
  - (c) Find the average rate of change of  $f(x)$  on the interval  $b \leq x \leq 2b$ .
6. Consider the function  $g(x) = 2x - 3$ .
- (a) What is the average rate of change of  $g(x)$  between the points  $(-2, -7)$  and  $(3, 3)$ ?
  - (b) The function  $g$  is either increasing or decreasing everywhere. Explain how your answer above tells you which.
  - (c) Graph the function.

7. Table 1.16 shows the times,  $t$  in sec, achieved every 10 meters by Carl Lewis in the 100-meter final of the World Championship in Rome in 1987. Distance,  $d$ , is in meters.

**Table 1.16**

$t$	0.00	1.94	2.96	3.91	4.78	5.64
$d$	0	10	20	30	40	50
$t$	6.50	7.36	8.22	9.07	9.93	
$d$	60	70	80	90	100	

- (a) For each successive time interval, calculate the average rate of change of distance. What is a common name for the average rate of change of distance?
- (b) Where did Carl Lewis attain his maximum speed during this race? Some runners are running their fastest as they cross the finish line. Does that seem to be true in this case?