

1. The graph of f is shown above.
 - (a) For how many values of c does $\lim_{x \rightarrow c} f(x) = 1$ [State the values of c]

 - (b) Let $g(x) = \int_{-1}^x f(t) dt$ and find the values of $g(-1)$, $g'(-1)$, and $g(1)$

 - (c) Does the graph of g have any horizontal tangents? [Justify]

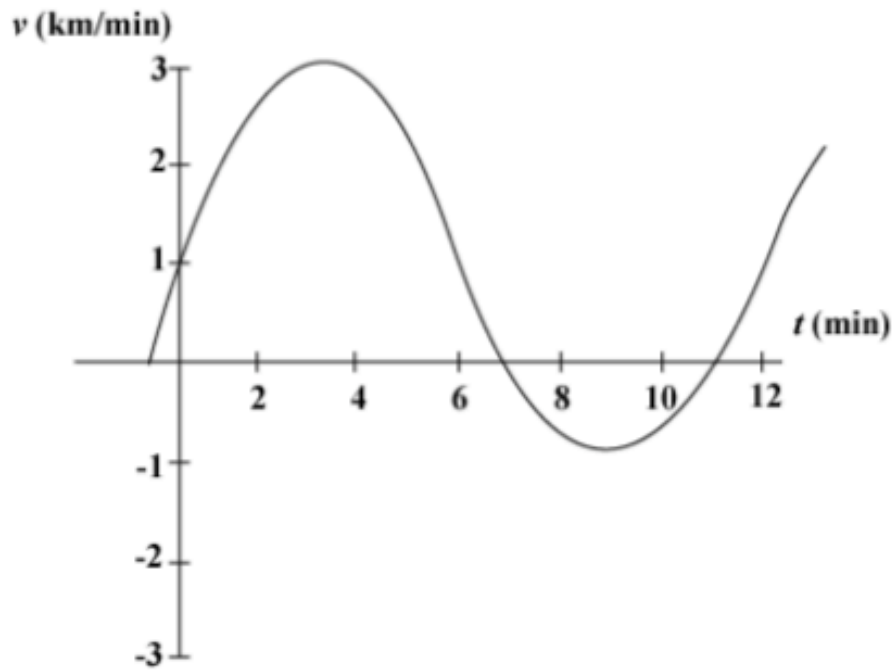
 - (d) Find any value(s) of x where the graph of g has a point of inflection. [Justify]

2. The following problem is from <http://www.jackmathsolutions.com/>
[Note: Ms. Mc Cleary did purchase the author's book so does not feel bad about using his problems]

A car is moving forward and backward along a straight road from A to B , starting from A at time $t = 0$. The car's velocity is given by

$v(t) = 1 + 2 \sin\left(\frac{\pi t}{6}\right)$ where t is in minutes and v is in km/min. The graph of

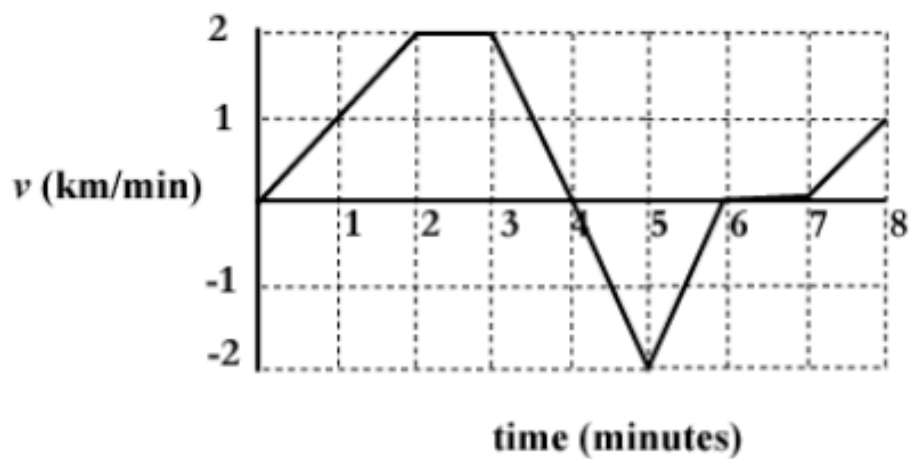
the velocity function is given below.



- What is the velocity of the car at $t = 0$?
- At what time(s) t does the car change direction?
- Find the average velocity of the car between $t = 0$ and $t = 9$.

3. This problem is also from <http://www.jackmathsolutions.com/>

A car is moving along a straight road from A to B , starting from A at time $t = 0$. Below is a graph of the car's velocity (positive direction from A to B), plotted against time.



- How many kilometres away from A is the car at time $t = 6$?
- At what time does the car change direction? Explain briefly.

4. The following problem was written by fine folks at ETS College Board

t (minutes)	0	4	8	12	16
$H(t)$ ($^{\circ}\text{C}$)	65	68	73	80	90

The temperature, in degrees Celsius ($^{\circ}\text{C}$), of an oven being heated is modeled by an increasing function H of time t , where t is measured in minutes. The table above gives the temperature as recorded every 4 minutes over a 16-minute period.

- (a) Use the data in the table to estimate the instantaneous rate at which the temperature of the oven is changing at time $t = 10$. Show the computations that lead to your answer. Indicate units of measure.
- (b) Write an integral expression in terms of H for the average temperature of the oven between time $t = 0$ and time $t = 16$. Estimate the average temperature of the oven using a left Riemann sum with four subintervals of equal length. Show the computations that lead to your answer.
- (c) Is your approximation in part (b) an underestimate or an overestimate of the average temperature? Give a Calculus-based reason for your answer.
- (d) Are the data in the table consistent with or do they contradict the claim that the temperature of the oven is increasing at an increasing rate? Give a reason for your answer.