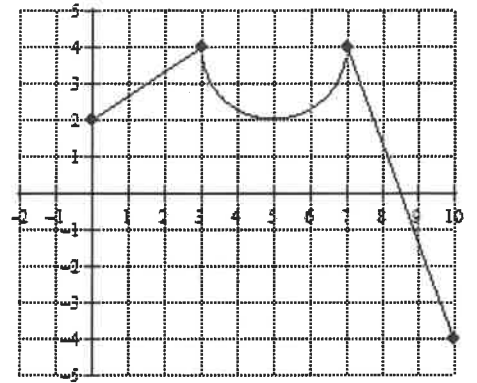


Day #52 Homework

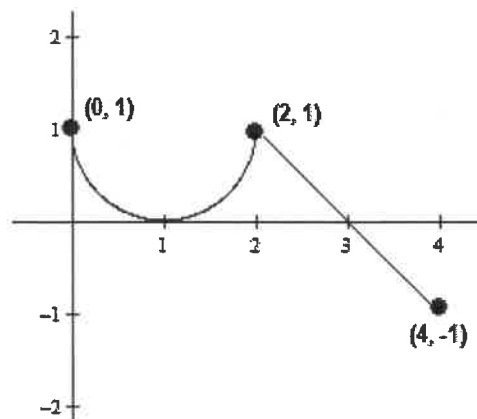
The graph to the right represents the velocity, $v(t)$ in meters per second, of a particle that is moving along the x -axis on the time interval $0 \leq t \leq 10$. The initial position of the particle at time $t = 0$ is 12.



- On what interval(s) of time is the particle moving to the left and to the right? Justify your answer.
- What is the total distance that the particle has traveled on the time interval $0 \leq t \leq 7$. Leave your answer in terms of π . Indicate units of measure.
- What is the net distance that the particle travels on the interval $5 \leq t \leq 10$? Round your answer to the nearest thousandth. Indicate units of measure.
- What is the acceleration of the particle at time $t = 2$? Indicate units of measure.
- What is the position of the particle at time $t = 5$? Indicate units of measure.

Pictured to the right is the graph of a function which represents a particle's velocity on the interval $[0, 4]$. Answer the following questions.

6. For what values is the particle moving to the right?
Justify your answer.



7. For what values is the particle moving to the left?
Justify your answer.

8. For what values is the speed of the particle increasing? Justify your answer.

9. For what values is the speed of the particle decreasing? Justify your answer.

10. What is the net distance that the particle travels on the interval $[0, 4]$?

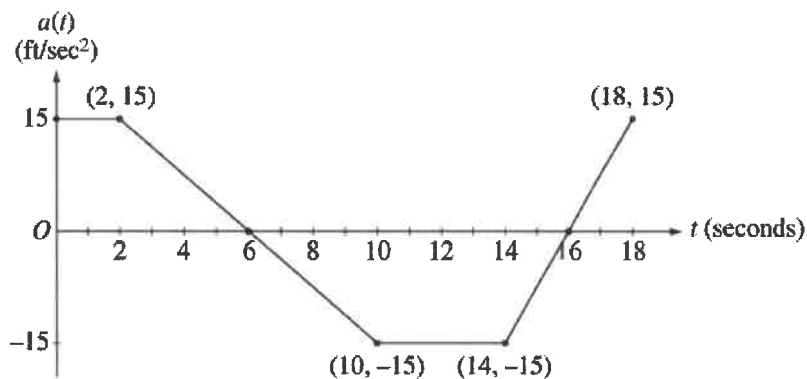
11. What is the total distance that the particle travels on the interval $[0, 4]$?

A car travels on a straight track. During the time interval $0 \leq t \leq 60$ seconds, the car's velocity, v , measured in feet per second, and acceleration, a , measured in feet per second per second, are continuous functions. The table below shows selected values of these functions.

t (sec)	0	15	25	30	35	50	60
$v(t)$ (ft/sec)	-20	-30	-20	-14	-10	0	10
$a(t)$ (ft/sec ²)	1	5	2	1	2	4	2

12. Using appropriate units, explain the meaning of $\int_0^{60} |v(t)| dt$ in terms of the car's motion. Approximate this integral using a midpoint approximation with three subintervals as determined by the table.
13. Using appropriate units, explain the meaning of $\int_{15}^{50} a(t) dt$ in terms of the car's motion. Find the exact value of the integral.
14. Is there a value of t such that $a'(t) = 0$? If so, on what interval does such a value exist? Justify your reasoning.
15. Using appropriate units, approximate the value of $v'(31)$. What does this value say about the motion of the car at $t = 31$.
16. Using appropriate units, find the value and explain the meaning of $\frac{1}{35} \int_{25}^{60} a(t) dt$.

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Problem #3



A car is traveling on a straight road with velocity 55 ft/sec at time $t = 0$. For $0 \leq t \leq 18$ seconds, the car's acceleration $a(t)$, in ft/sec^2 , is the piecewise linear function defined by the graph above.

- Is the velocity of the car increasing at $t = 2$ seconds? Why or why not?
- At what time in the interval $0 \leq t \leq 18$, other than $t = 0$, is the velocity of the car 55 ft/sec? Why?
- On the time interval $0 \leq t \leq 18$, what is the car's absolute maximum velocity, in ft/sec, and at what time does it occur? Justify your answer.
- At what times in the interval $0 \leq t \leq 18$, if any, is the car's velocity equal to zero? Justify your answer.

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Problem #3

A particle moves along the x -axis so that its velocity v at any time t , for $0 \leq t \leq 16$, is given by $v(t) = e^{2 \sin t} - 1$. At time $t = 0$, the particle is at the origin.

- (a) On the axes provided, sketch the graph of $v(t)$ for $0 \leq t \leq 16$.
- (b) During what intervals of time is the particle moving to the left? Give a reason for your answer.
- (c) Find the total distance traveled by the particle from $t = 0$ to $t = 4$.
- (d) Is there any time t , $0 < t \leq 16$, at which the particle returns to the origin? Justify your answer.

