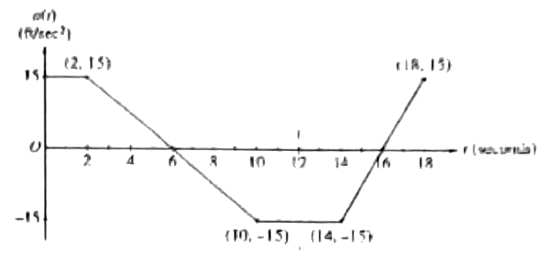
NAME James Ding
AP Calculus

DATE ______________
FRQ #24

# Graph

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




a) Is the velocity of the car increasing at $t = 2$ seconds? Why or why not?

Yes. Because the function $a(t)$ is positive a $t=2$, that mean the car must be acelarating, or having a positive rate of change to velocity

b) At what time in the interval $0 \le t \le 18$, other than $t = 0$, is the velocity of the car 55 ft/sec? Why?

$t = 12$

$\int_0^t a(t) = 0$. Area under function must be equal to 0, as you want to total change to be zero.

c) On the time interval $0 \le t \le 18$, what is the car's absolute maximum velocity, in ft/sec, and at what time does it occur? Justify your answer.

~~62.5~~ $t=6$. The highst velocity, according to chart below occurs at $t=6$.

| $t$ | $v(t)$ |
|---|---|
| 0 | 55 |
| 6 | 115 |
| 18 | 25 |

d) At the times in the interval $0 \le t \le 18$, if any, is the car's velocity equal to zero? Justify your answer.

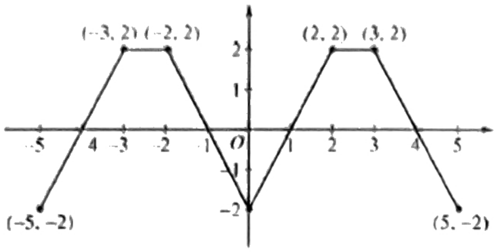
$55 + \int_0^t a(x)\,dx = 0$

$\int_0^t (a(x))\,dx = -55$, no. Area under curve never goes that low.

NAME <u>gemstory</u> DATE ____________
AP Calculus FRQ #25

## Graph

The graph of $f$ consists of six line segments. Let $g$ be the function given by $g(x) = \int_0^x f(t)\,dt$.




Graph of $f$

(a) Find g(4), g′(4), and g′′(4).

$g(4)=3$

$g'(4)=0$

$g''(4)=-2$

(b) Does $g$ have a relative min, a relative max, or neither at x = 1? Justify.

$g'(x)=0$

i.e. $f(x)=0$

$g'(1)=0$

x=1, relative min changes from negative to positive.

(c) Suppose that $f$ is defined for all real numbers $x$ and is periodic with a period of length 5. The graph above shows two periods of $f$. Given that $g(5) = 2$, find $g(10)$ and write an equation for the line tangent to the graph of $g$ at x = 108.

$g(10) = \int_0^{10} f(t)\,dt = 2\int_0^{5} f(t)\,dt.$

(=4)

~~g(108)~~

$21(2) + \int_0^3 f(t)\,dt$

$21 \times 2 + 12 = 47$

$\boxed{y - 41 = 2(x-100)}$