HW: Note Card is due Tuesday, Dec. 20

Do Now: We will switch with partners to "grade" homework; Below is the solution to the checkin, I'm handing these back

(a) Since $R(6) = 4.438 > 0$, the number of mosquitoes is increasing at $t = 6$.

1 : shows that $R(6) > 0$

$Y_1, X, 6$

nDeriv (function, var, value)

(b) $R'(6) = -1.913$
Since $R'(6) < 0$, the number of mosquitoes is increasing at a decreasing rate at $t = 6$.

$2 : \begin{cases} 1 : \text{considers } R'(6) \\ 1 : \text{answer with reason} \end{cases}$

(c) $1000 + \int_0^{31} R(t)\,dt = 964.335$
To the nearest whole number, there are 964 mosquitoes.

First find 3 dec place answer, then round

$2 : \begin{cases} 1 : \text{integral} \\ 1 : \text{answer} \end{cases}$

(d) $R(t) = 0$ when $t = 0$, $t = 2.5\pi$, or $t = 7.5\pi$
$R(t) > 0$ on $0 < t < 2.5\pi$
$R(t) < 0$ on $2.5\pi < t < 7.5\pi$
$R(t) > 0$ on $7.5\pi < t < 31$
The absolute maximum number of mosquitoes occurs at $t = 2.5\pi$ or at $t = 31$.

$$1000 + \int_0^{2.5\pi} R(t)\,dt = 1039.357,$$

There are 964 mosquitoes at $t = 31$, so the maximum number of mosquitoes is 1039, to the nearest whole number.

$4 : \begin{cases} 2 : \text{absolute maximum value} \\ \quad 1 : \text{integral} \\ \quad 1 : \text{answer} \\ 2 : \text{analysis} \\ \quad 1 : \text{computes interior critical points} \\ \quad 1 : \text{completes analysis} \end{cases}$

Solution to Last Night's HW

(a) $W'(12) \approx \dfrac{W(15) - W(9)}{15 - 9} = \dfrac{67.9 - 61.8}{6}$
$= 1.017$ (or 1.016)
The water temperature is increasing at a rate of approximately $1.017\ ^\circ\text{F}$ per minute at time $t = 12$ minutes.

$2 : \begin{cases} 1 : \text{estimate} \\ 1 : \text{interpretation with units} \end{cases}$

(b) $\int_0^{20} W'(t)\,dt = W(20) - W(0) = 71.0 - 55.0 = 16$
The water has warmed by $16\ ^\circ\text{F}$ over the interval from $t = 0$ to $t = 20$ minutes.

$2 : \begin{cases} 1 : \text{value} \\ 1 : \text{interpretation with units} \end{cases}$

(c) $\dfrac{1}{20}\int_0^{20} W(t)\,dt \approx \dfrac{1}{20}(4 \cdot W(0) + 5 \cdot W(4) + 6 \cdot W(9) + 5 \cdot W(15))$
$= \dfrac{1}{20}(4 \cdot 55.0 + 5 \cdot 57.1 + 6 \cdot 61.8 + 5 \cdot 67.9)$
$= \dfrac{1}{20} \cdot 1215.8 = 60.79$
This approximation is an underestimate, because a left Riemann sum is used and the function W is strictly increasing.

$3 : \begin{cases} 1 : \text{left Riemann sum} \\ 1 : \text{approximation} \\ 1 : \text{underestimate with reason} \end{cases}$

(d) $W(25) = 71.0 + \int_{20}^{25} W'(t)\,dt$
$= 71.0 + 2.043155 = 73.043$

$2 : \begin{cases} 1 : \text{integral} \\ 1 : \text{answer} \end{cases}$

$$W(25) - W(20) = \int_{20}^{25} W'(t)\,dt$$

$$W(25) = W(20) + \int_{20}^{25} W'(t)\,dt$$

Using the calculator: What's allowed and what's clever

1. Graph a function
2. Use solver or intersect to find roots or solutions
3. Find the derivative of a function at a pt. (NDERIV)
4. Find the value of a definite integral

Calculator tricks

1. Put the functions in $Y_1 =$, $Y_2 =$ ...
2. Use alpha-TRACE for Y_1, Y_2
   alpha-WINDOW for fnInt

Look at the AP problems you've done. In your groups, generate some entries for this table. We'll put it together as a class.

When you see the words . . .	You should think
Estimate $W'(12)$ [from a table]	Find a difference quotient with neighboring values
Amount at a given time	$\int_a^b$ Rate + Initial Amount (Rate In − Rate Out)
Accumulation	$\int_a^b$ Rate
Max, Min of Accumulated Quantity	When Rate In = Rate Out (stationary pts) Check endpts.
When is max/min → vs What is max/min →	x value y value
Is quantity inc/dec?	Is rate pos or neg
Given $\int_c^t g(x)dx = f(t)$ Graph of g Inc, Dec, Concavity Value of $f(x)$, $f'(x)$ Estimate, approximate	$f'(t) = g(t)$ These are like Unit 1. Use area to find integral Read it from the graph ≈
Find pts of inflection	Where deriv changes direction