

## The 'Skeeter Problem 2004AB2B



For  $0 \leq t \leq 31$  the rate of change of the number of mosquitoes on Tropical Island at time  $t$  days is modeled by  $R(t) = 5\sqrt{t} \cos\left(\frac{t}{5}\right)$  mosquitoes per day. There are 1000 mosquitoes on Tropical Island at time  $t=0$ .

Are there any important "clues"?

$R(t)$  is A DERIVATIVE  
at  $t=0$  there are 1000 'skeeters

This is a calculator problem so what should we probably do first?  $y_1 = R(t)$

(a) Show that the number of mosquitoes is increasing at time  $t = 6$

$$R(6) \approx 4.438$$

$R(6) > 0$  Hence the # of mosquitoes is increasing at  $t=6$

(b) At time  $t=6$ , is the number of mosquitoes increasing at an increasing rate, or is the number of mosquitoes increasing at a decreasing rate? Give a reason for your answer.

$$R'(6) \approx -1.913$$

Since  $R'(6) < 0$  then the # of mosquitoes is increasing at a decreasing RATE

(c) According to the model, how many mosquitoes will be on the island at time  $t=31$ ? Round your answer to the nearest whole number.

$$1000 + \int_0^{31} R(t) dt \approx 964.335$$

INITIAL AMT OF 'skeeters + ACCUMULATED # OF 'skeeters

at  $t=31$  there are about 964 mosquitoes

(D) To the nearest whole number, what is the maximum number of mosquitoes for  $0 \leq t \leq 31$ ? Show the analysis that leads to your conclusion.

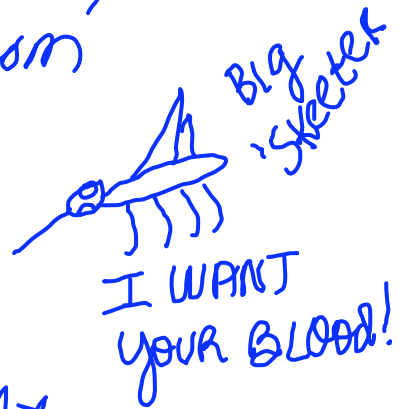
(7.854) (23.562)

$R(t) = 0$  at  $t = 0, 2.5\pi, 7.5\pi$

At  $t = 2.5\pi$   $R(t)$  changes from positive to negative values.

at  $t=0$  there are 1000 bugs,

at  $t=31$  " 964



At  $t = 2.5\pi$  there are about 1039 mosquitoes

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

At  $t = 2.5\pi$  there is a max # of 1039 mosquitoes!

Homework: Do the Sewage Problem [Eww!]

$E(t)$  is a rate of  $\Delta$

$E(t)$  entering sewage RATE

645 gallons/hr is the rate at which  
Treated sewage EXISTS

Ponder - How much sewage  
is in the TANK at  $t=2$

$$\int_0^2 E(t) dt - \int_0^2 645 dt$$

Accum of Entering Sewage — Accum of Exiting Sewage

To find c.v. for min/max

$$\text{let } 0 = E(t) - 645$$