CALC OK: For $0 \leq t \leq 31$, the <u>rate of change of the number of mosquitoes on Tropical Island at</u> time t days is modeled by R(t)=5tcos(t5) mosquitoes per day. There are 1000 mosquitoes on Tropical Island at time $t=0$.

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

$$R(6) = 5(6)\cos(30) = 4.627 \text{ or } 4.628 \text{ mosquitoes/day}$$

R(6) is positive, so the number of mosquitoes is increasing.

derivative of R(t)

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

$$R'(t) = 5t(-\sin(5t) \cdot 5) + 5\cos(5t)$$
$$R'(6) = -30\sin(30) \cdot 5 + 5\cos(30) = 148.976 \text{ mosquitoes/day}^2$$

if you have a calculator, jump straight here.

The number of mosquitoes is increasing at an increasing rate b/c R'(6) is positive. That means R(t), the rate of change of mosquitoes is increasing. R(6) is positive [# of mosquitoes is increasing]. That means R'(6) being positive shows the population is increasing at an increasing rate.

NO CALC: People are entering a building at a rate modeled by $f(t)$ people per hour and exiting the building at a rate modeled by $g(t)$ people per hour, where t is measured in hours. The functions f and g are nonnegative and differentiable for all times t. Write an inequality that indicates that the <u>rate of change of the number of people in the building</u> is increasing at time t?

use both enter and exit rate

$$f(t) - g(t) > 0$$

b/c if f(t)-g(t) is positive, overall the # of people in the building is increasing (in other words, rate in > rate out)

HW: Watch the Three videos on Related Rates and take notes. SUPER IMPORTANT!