Hint 3.5

Remember this is a calculus class your answers should be based on using your calculus skills and not just from your calculator.
40. increasing or decreasing (use the first derivative)

Concave up or concave down (use the second derivative)
48. (make sure you understand \#44)
(a) Use transformations to draw one year of this function. This function has been used many times this semester. 2.3 and 2.5 besides 1.5 . Look up previous answer keys and work. This graph should clearly show information of the information in the given function.

Part band c USE CALCULUS. A graphic interpretation and answers are not acceptable since we now know how to find the derivative of the function. Those questions were asked in 2.5.
The sine function is a smooth function, so the maximum and minimum of the sine function will occur when the first derivative is zero. Find the first derivative, set it equal to zero and solve using algebra/trig skills. The use the graph or interval testing to see if it is a max or $\min$ from your solution.

The population grows the fastest occurs at the max and min of the first derivative. To find those we need to find the second derivative, set equal to zero and solve.
Recall that July $1^{\text {st }}$ is 0.5 of a year.

## Hardest part is solving trig functions.

AN EXAMPLE on solving trig functions. DO NOT USE inverse function since it does not find all the solutions. This is not your equation.

$$
\begin{array}{cc}
45 \sin (2 \pi(t-.5))=0 \\
& \sin (2 \pi(t-.5))=0 \\
\text { Let } x=2 \pi(t-.5) \quad & \sin (x)=0 \\
& x=-\pi, 0, \pi, 2 \pi, \text { etc. }
\end{array}
$$

Now solve for $t$ :
$2 \pi(t-.5)=-\pi$
$2 \pi(t-.5)=0$
$2 \pi(t-.5)=\pi$
$2 \pi(t-.5)=2 \pi$
$t-.5=-0.5 \quad t-.5=0$
$t=0$
$t=.5$
$t-.5=0.5$
$t-.5=1$
$t=1$
$t=1.5$

Then I would look in the domain to figure out which one pertains to the story problem.
To find max and min of a function use the interval testing to see if the derivative function is positive or negative (Then f would be at a max) or negative to positive ( f would be at a min).

