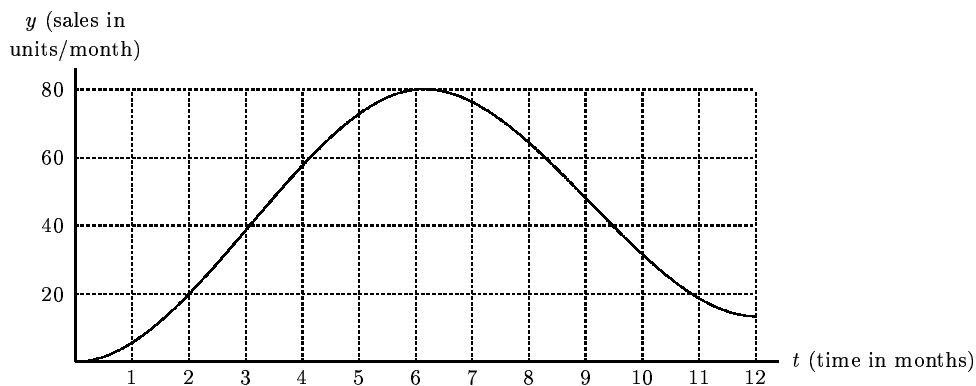


7. (18 points) Aberister is a small company which sells clothing items for youngsters in North America. When the new designs are released on January 1, 2005, the company projects sales $y(t)$ of shirts (in units of 1,000 items per month) for the year 2005 to be as shown in the figure. As the figure shows, sales are expected to increase until the summer when most “target” customers will have made their purchases, and then decline for the remainder of the year.



(a) Write an expression for $A(t)$, the projected monthly average number of units which will have been sold in the first t months of the year.

$$A(t) =$$

(b) Why is the value of $A(t)$ always less than 80, for any value of $0 < t \leq 12$?

(c) Approximate the value of $A(t)$ at $t = 3$. Explain how you arrived at your approximation.

ANSWER: $A(3) =$ _____

Problem continued from previous page.

Assuming the price of the shirts remains constant throughout the year, Aberister will maximize its profit on the 2005 designs by launching its next collection, the holiday seasons designs, when $A(t)$ is maximum.

(d) Suppose that at time t_{max} the value of A is maximum. What is the relationship between the values of y and A at time t_{max} ? Explain.

(e) Sketch a graph of the function $A(t)$ on the above figure (previous page). Be sure to show where $A(t)$ is increasing and decreasing. Use your graph to estimate the time of the year when Aberister should launch its new collection.