Name_____ Date_____ Per_____

Worksheet: Sinusoids: Do all work on separate notebook paper.

Part I: Sketching from equations

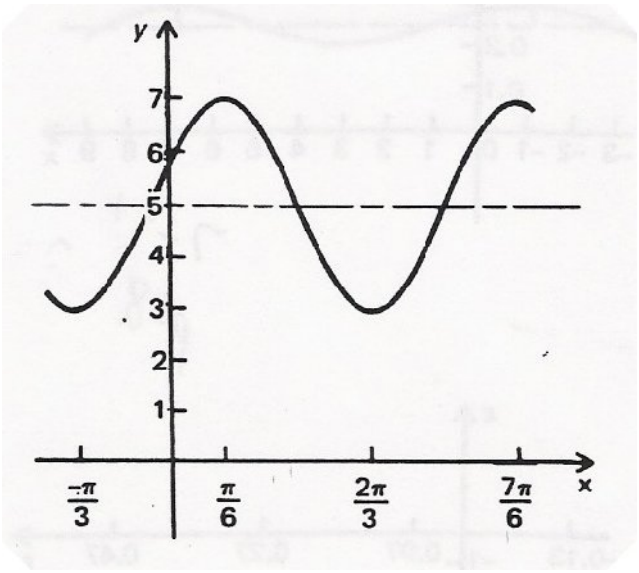
For problems 1 through 4, ON NOTEBOOK PAPER, sketch at least **two** cycles, of the graph of the sinusoidal functions.

1. $y = 3 + 2\cos\frac{1}{5}(x - \pi)$
2. $y = 5\sin\frac{2}{3}\left(x + \frac{\pi}{2}\right) - 4$
3. $y = 6\sin\left(\frac{\pi}{4}x - \frac{\pi}{4}\right) + 2$
4. $y = -5 + 4\cos\frac{\pi}{3}(x + 2)$

Part II: Writing equations from graphs

For Problems 5 through 10, write at least two equations of the sinusoid sketch, one with sine, one with cosine, one of which has a **negative** amplitude.

5.



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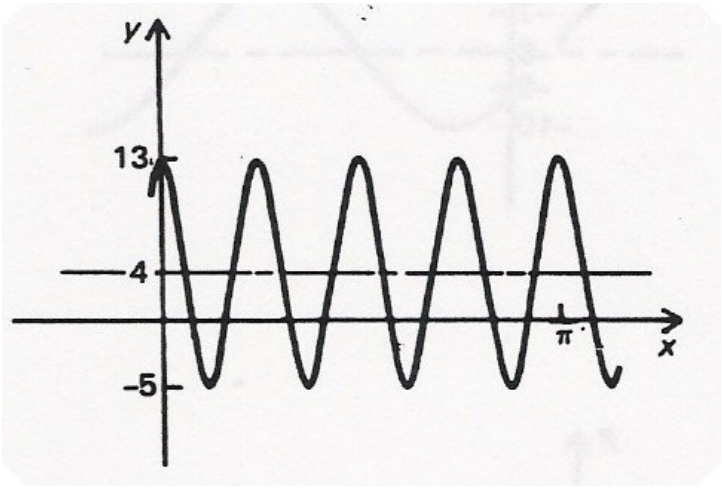

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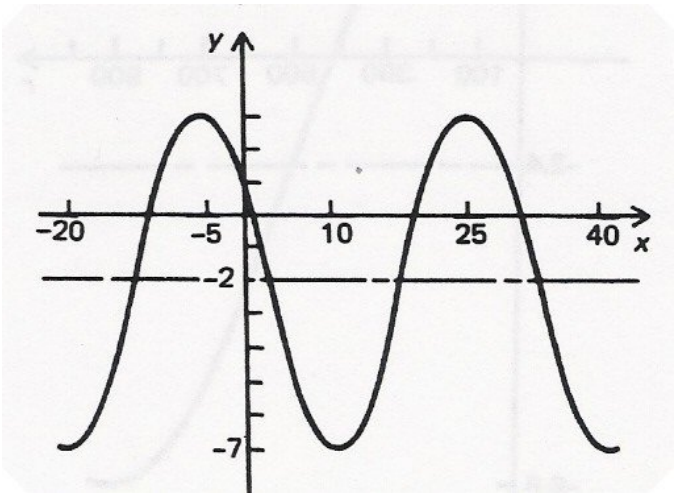

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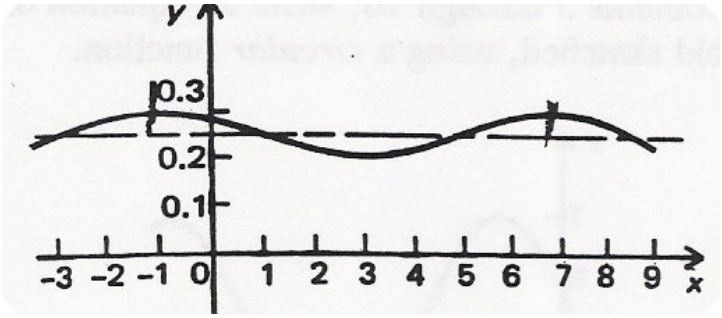

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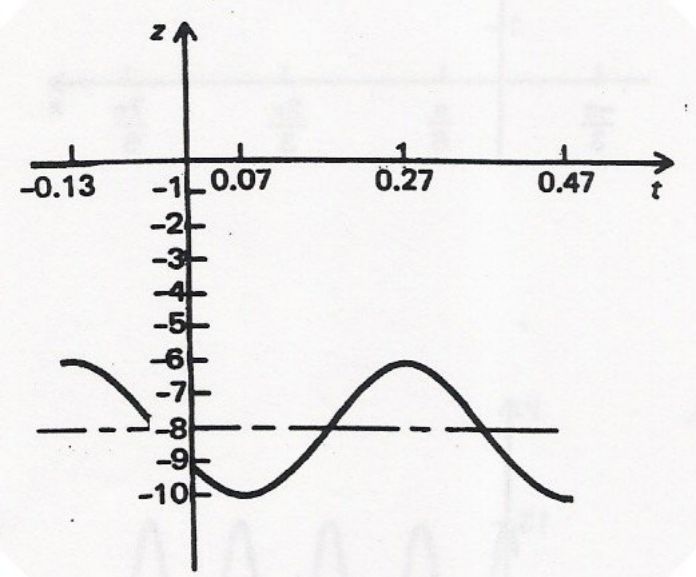

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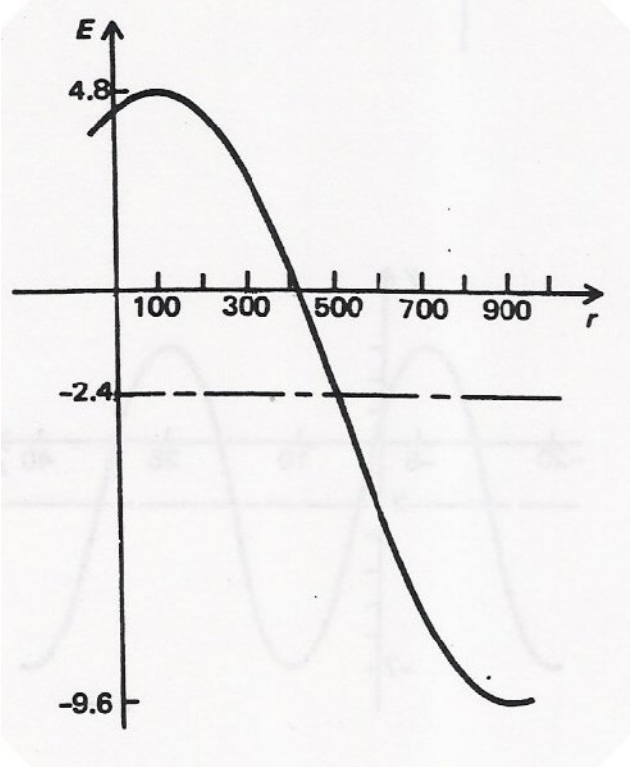
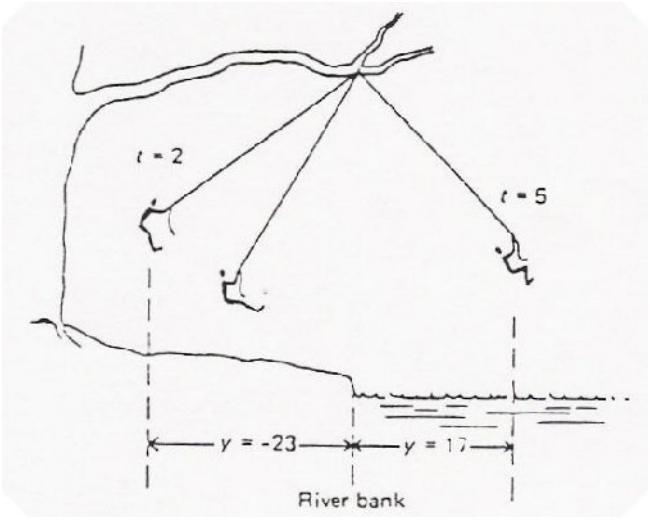


Part III: Applications

Tarzan is swinging back and forth on his grapevine. As he swings, he goes back and forth across the riverbank, going alternately over land and water. Jane decides to model mathematically his motion and starts her stopwatch. Let t be the number of seconds the stopwatch reads and let y be the number of meters Tarzan is from the riverbank. Assume that y varies sinusoidally with t, and that y is positive when Tarzan is over water and negative when he is over land.



Jane finds that when $t = 2$, Tarzan is at one end of his swing, where $y = -23$. She finds that when $t = 5$, he reaches the other end of his swing and $y = 17$.

a. Sketch a graph of **2** cycles of this sinusoidal function. Label all critical values, high and low points, and your axes (with units).
b. Write 3 different equations expressing Tarzan's distance from the river bank in terms of t, one in terms of positive sine, one in terms of cosine, and a different one in terms of either, but with a negative amplitude value.
c. Predict y when: (give his numeric position with units, say if he is over land or water, and which direction he is going).
   i. $t = 3.8\,\text{sec}$
   ii. $t = 8.52\,\text{sec}$
   iii. $t = 22\,\text{sec}$
   iv. $t = 5\,\text{min}$
   v. $t = 2hr$
   vi. $t = 3days$
d. Where was Tarzan when Jane started the stopwatch? Give numeric position, if he was over land or water, and which direction he was heading.
e. Find the value of t for which Tarzan is directly over the riverbank for the 5^{th} time.
f. Find the value of t for which Tarzan is 16 meters over land for the third time.
g. If Jane had started her stopwatch 14 seconds after she actually did, what would a new possible equation be, assuming everything else is the same. Also assume that Tarzan is having a blast on the swing.