Finding the Equation of a Sine Curve Using Biorhythm Graphs

WebQuest Description: Finding the equation of a Sinusoidal curve from its graph.
Grade Level: College / Adult
Curriculum: Math
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Introduction

What are biorhythms? Biorhythms are cycles that attempt to describe energy levels or capacities for performance in various areas. The three "primary" biorhythms are:- physical : describes physical energy, reflexes, strengths, stamina- emotional: describes emotional stability and empathy- intellectual: describes mental aptitude, creativity, and problem solving capabilitiesWhen the biorhythm line is above the 0% line, your capacity in that area is enhanced; you feel stronger, more alert, more connected, more empathetic. These are times when you are able to do more, be more, enjoy more. When the biorhythm lines are below 0%, your capacity is diminished, and conservative behavior is recommended. Finally, when a biorhythm line crosses the 0% line, or crosses another biorhythm line, energies are unpredictable and may not be favorable to you.

Tasks

Objectives: Estimate the equations of your personalized biorhythm graphs by using the standard sine equation, y = d + asin[b(x-c)]. Use the sine regression function on the Ti-83, Ti-84 or Ti-84 Plus graphing calculator to find the equations of your graphs. Predict your biorhythms for the day of the final exam using both sets of equations, then calculate the percent error for each graph between your two equations.

Part 1: Obtaining sine equations from the period, amplitude, phase shift and vertical shift of a graph.1. Create your personalized biorhythm graphs by going to the following website: Biorhythms. Enter your birth date and enter June 22 for the biorhythm date. Pick XLarge for the size and 44 for the width. When you click on go, your personalized biorhythm graph will be generated and you will see three sine graphs. Print your personalized biorhythm graph.2. Write the equations of the three sine graphs (Physical, Emotional and Intellectual) in the form y = d + asin[b(x-c)]. Go to the following websites to review the concepts of period change (b), amplitude change (a), phase shift (c), and vertical shift (d). The following website has an applet that demonstrates the transformations of the sine wave ans the parameters are changed: sine wave applet.3. Obtaining sine equations using sine regression with the graphing calculator.1. Make a grid on your biorhythm graph. Your horizontal axis (x) will be the line on the far left (5/31) and your vertical axis (y) will be the horizontal line down the middle (0). Draw vertical lines through the following days: 6/2, 6/5, 6/8, 6/11, 6/14, 6/17, 6/20, 6/23, 6/26, 6/29. Divide the vertical axis in a scale of ten (where 0 is in the middle). Fill out the tables in the attachment below with the information obtained from the biorhythm graphs using the grid you made.3. Follow the instruction for the sine regression with the TI calculator (attachment below) to obtain regression equations from the data collected on the tables from your personalized biorhythm graphs (Physical, Emotional and Intellectual). Part 3: Biorhythm predictions for the day of the final exam and Percent Error. 1. Use the Physical, Emotional and Intellectual estimated equations obtained in Part 1 to predict what will be your biorhythms on June 22. In other words, find the value of your equation when x = 22. 2. Use the Physical, Emotional and Intellectual equations obtained in Part 2 to predict what will be your biorhythms on June 22. In other words, find the value of your equation when x = 22. 3. Use the predictions obtained to calculate the percent error for each biorhythm (Physical, Emotional and Intellectual) using the estimated equations results. 4. Use the predictions obtained to calculate the percent error for each biorhythm (Physical, Emotional and Intellectual) using the regression equations results.
Evaluation

You will need to turn in: your personalized biorhythm graphs with the grid form part 2. estimated equations from part 1, in the form \( y = d + a \sin[b(x-c)] \), with the necessary work. sine regression equations from part 2, in the form \( y = d + a \sin[b(x-c)] \), with the tables of values filled out. calculations for the predictions of the estimated and regression equations, and the percent errors obtained.

<table>
<thead>
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<th>Category and Score</th>
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<tr>
<td>Biorhythm Graphs</td>
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<td>Estimated Equations</td>
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<td>Regression Equations</td>
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<td>Percent Error</td>
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Conclusion

Compare your percent errors obtained from the estimated equations to the ones obtained from the regression equations (for the physical, emotional and intellectual equations) in part 3. Which set of equations (estimated or regression) gave you the closest values, smallest percent error? Why do you think these equations were more accurate? How could you improve your results to get a smaller percent error?

Teacher Page

This project is a good activity to do when discussing how to obtain the equation of a sine curve from a graph. It helps students to see a real-life application of the lesson. It also teaches them how to use technology to obtain the equations and accuracy of calculations. Credits The following websites were used on this webquest:

- http://sitefoundry.com/biorhythms
- http://www.usna.edu/MathDept/website/courses/calc_labs/sinecurve/SineCurve.html

Thanks to Jim Condor who came up with the idea for this project!

Standards

Credits

Other