




Overlapping Gaussians Exploration Questions




1. How would changing the standard deviation of the Gaussian Curve affect the graph? (Hint: The slider for standard deviation is red.)
2. The x-value at the peak of the curve represents the mean of the distribution. Which slider will adjust the mean?
3. Just like with trigonometric functions, the amplitude is the height of the curve. Which slider will adjust the amplitude?

For questions 4-7, adjust the slider limits and window settings as follows:

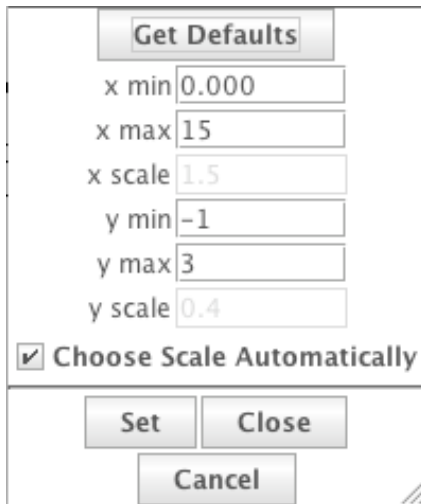
Gaussian 1

| Slider Color | Min | Max | Step |
|---|----------------------------------|----------------------------------|----------------------------------|
|  | <input type="text" value="0.0"/> | <input type="text" value="2.0"/> | <input type="text" value="1"/> |
|  | <input type="text" value="3.0"/> | <input type="text" value="6.0"/> | <input type="text" value="0.5"/> |
|  | <input type="text" value="0.5"/> | <input type="text" value="1.5"/> | <input type="text" value="0.5"/> |

Gaussian 2

| Slider Color | Min | Max | Step |
|---|----------------------------------|----------------------------------|----------------------------------|
|  | <input type="text" value="0.2"/> | <input type="text" value="1.0"/> | <input type="text" value="0.4"/> |
|  | <input type="text" value="6.0"/> | <input type="text" value="8.0"/> | <input type="text" value="1"/> |
|  | <input type="text" value="0.5"/> | <input type="text" value="1.5"/> | <input type="text" value="0.5"/> |

Set Window



The 'Set Window' dialog box contains the following elements:

- A 'Get Defaults' button at the top.
- Input fields for 'x min' (0.000), 'x max' (15), 'x scale' (1.5), 'y min' (-1), 'y max' (3), and 'y scale' (0.4).
- A checkbox labeled 'Choose Scale Automatically' which is checked.
- Buttons for 'Set', 'Close', and 'Cancel' at the bottom.

A new standardized test for determining if an elderly person is at risk for developing Alzheimer's disease is scored on a scale from 0-12. Scores less than 6 are considered not at risk while scores above 6 are at risk for developing Alzheimer's disease. Let Gaussian 1 represent a sample of elderly people known not to be at risk for Alzheimer's and Gaussian 2 represent a sample of elderly known to be at risk for developing Alzheimer's.

4. What is the probability that a person from the not at risk group will be labeled as at risk for Alzheimer's? This case is called a Type I Error. (To do this, place the black slider at $x=6$, the threshold for determining the risk of Alzheimer's disease, then note the "Area under Red Gaussian to the right of x ." Then move the black slider all the way to the left and once again note the "Area under Red Gaussian to the right of x ." Then divide the first number by the second number.)

5. Conversely, a Type II Error is the case in which an elderly person at risk of developing Alzheimer's is given the diagnosis that they are not at risk. What is the probability of a Type II Error?
6. Does this seem like a reliable test for the risk of Alzheimer's disease? Why or why not?
7. Move Gaussian 1 slightly to the left and Gaussian 2 slightly to the right by adjusting the green slider and repeat questions 4-6.
8. Why do you think your answer to question 6 has changed after adjusting the curves?