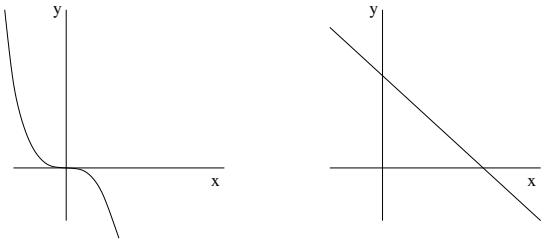
Supplementary Problem IV for Physics 6

In casual conversation, the term "inversely proportional" is sometimes used to refer to any relationship in which one variable decreases as the other increases. However, in formal math and physics usage, "inversely proportional" has a more specific meaning, just as "proportional" does. The graphs below show examples of relationships between two variables x and y that are *not* inversely proportional, even though y decreases as x increases.

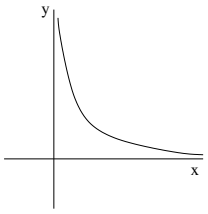


Not inversely proportional

An **inversely proportional** relationship is one in which x and y obey the equation

$$y = \frac{c}{x},$$

where c is a constant. (This could also be written as $xy = c$.) The graph of two inversely proportional quantities would look something like this:

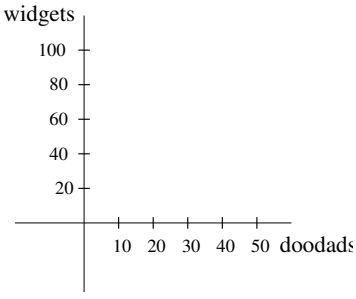


Inversely proportional

a) The table below shows some imaginary experimental data for two quantities, "widgets" and "doodads."

Widgets	**Doodads**
125.0	10.0
59.0	20.0
42.0	30.0
30.5	40.0
23.5	50.0

Plot a graph of widgets vs. doodads on the axes below, based on the given data.



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b) Based on this data, is it reasonable to say that widgets are inversely proportional to doodads? Support your answer with a quantitative argument. (Hint: examine the product widgets×doodads. Remember that these are experimental data, and so there is some uncertainty associated with them. It will be helpful to consider percent differences.)

c) Give an example of two real-life physical quantities that should be inversely proportional, and a situation in which this would happen. (Hint: consider Newton's second law. What would you have to keep constant, and what would be allowed to vary?)