Vertical line test graph

Vertical line testing is a method used to determine whether a given relationship is a function or not. The approach is rather simple. Draw a vertical cutting line through the relationship chart, and then observe the intersection points. Why does this work? The vertical line test supports the definition of a function. That is, each x value in a function must be combined with a y value. , this indicates that a single x value is associated with more than one y value. Well, here's what's going to happen! If a vertical line intersects the chart in all places exactly in one place, then the relationship is a function. Here are some examples of relationships that are also functions because they pass the vertical line test. Cut or hit the chart at exactly one point Chart of line f\left (x \right) = x + 1 Chart of the square function (parabola) f\left(x \right) = {x^2} - 2 Chart of the cubic function f\left (x \right) = {x^3} If a vertical line intersects the chart in some places in more than one point, then the relationship is not a function. Here are some examples of relationships that are NOT functions because they fail the vertical line test. Cutting or hitting the chart at more than one point Chart of the sideways parabola x = y2 Chart of the circle x2 + y2 = 9 Chart of the relationship x = y3 − y + 2 You may also be interested: Horizontal Line Test Answer: A method to distinguish functions from relationships. The vertical line test. is a way to determine whether a relationship is a function. indicates that if a vertical line intersects the relationship chart more than once, then the relationship is a NOT function. Function definition: Each x value has a unique y value. Let's look at the two relationships below that These two relationships differ only by 1 number! The vertical line test: The vertical line: A curve at the \(xy\) level is the chart of a \(x\) function if and only if no vertical line intersects the curve more than once. The reason for the truth of the vertical line test can be seen in Figure 13. If each vertical line \(x = intersects a curve only once, in \(\left({a,b} \right)\), then exactly one functional value is defined by \(f\left(a \right) = b\). But if a line \(x = a\) intersects the curve twice, in {a,b} \right)\) and \(\left({a,c} \right)\), then the curve cannot be represented because a function cannot assign two different values to \(a\). For example, the \(x = {y^2} - 2\) parable that appears in Figure 14(a) is not the chart of a \(x\) function, because, as you can see, there are vertical lines that intersect the parable twice. The parable, however, contains the charts of the two functions of \(x\). Notice that the equation \(x = {y^2} - 2\) indicates \({y^2} = x + 2\), so \(y = \pm \sqrt {x + 2} \). Thus, the upper and lower half of the parable are the graphs of the functions \(f\left(x \right) = \sqrt {x + 2} \) and \(g\left(x \right) = - \sqrt {x + 2} \). (See Figures 14(b) and (c)). We notice that if we reverse the roles of x and y, then the equation \(x = h\left(y \right) = {y^2} - 2\) defines x as a function of y (with y as an independent variable and x as a dependent variable) and parabola is now displayed as the graph of the function \(h\). The functions in the following examples are defined by different types in different parts of their domains. Such functions are called piece-by-piece functions. Example- 5 A \(f\) function is defined by \[f\left(x \right) = \left\{ \begin{align}&1 - x & {\rm{if \\\\;}} x \le 1\\&{x^2} & {\rm{if \;\;}} x > 1\end{align} \right.\] Evaluate \(f\left(0 \right),\;f\left(1 \right),\;{ \rm{and }}f\left(2 \right)\) and draw the chart. \(x \le 1\), then the value of \(f\left(x \right)\) is \(1 - x.\) On the other hand, if \(x > 1\), then \(f\left(x \right)\) is \({x^2}\). From \(0 \le 1,\) we have \(f\left(0 \right) = 1 - 0 = 1\) From \(1 \le 1,\) we have \(f\left(1 \right) = 1 - 1 = 0\) From \(2 > 1,\) we have \(f\left (2 \right) = {2^2} = 4\) How do we draw the chart of \(f\,?\) We notice that if \(x \le 1\), then \(f\le) = 1 - x,\) so it must be the portion of the f chart to the left of the vertical line \(x = 1\) coincide with the line \(y = 1 - x,\) which has a gradient of –1 and y – intercept 1. If \(x > 1, \) then \(f\left(x \right) = {x^2}\), therefore the portion of the f chart to the right of the \(x = 1\) line must coincide with the \(y = {x^2}\) chart, which is a parable. This enables us to draw the chart in the shape. The solid dot indicates that point (1, 0) is included in the chart. the open dot indicates that point (1, 1) is excluded from the chart. The next example of a track-defined function is the absolute value function. Remember the absolute value of a number a, declared by |a|, is the distance from a to 0 in the actual number line. Distances are positive or 0, so we have \\left| a \right| \ge 0\) for each number for example, 3 \right| = 3\;\\;\;\;\;\;\\\\left| { - 3} \right| = 3\;\\;\;\;\;\;\\\\left| 0 \right| = 0\;\\;\;\;\;\;\\\\left| {\sqrt 2 - 1} \right| = \sqrt 2 - 1 \;\;\\\\\\left| {3 - \pi } \right| = \pi - 3\end{align}\] Generally, we have \\fbox{${\left| a \right| = a\quad {\rm{\if}\a\ge 0\\left| a \right| = - a\quad {\rm{\?if \?}} one < 0}$} \) (Remember that if \(a\) is negative, then \(-a\) is positive). left| x \right| = \left\{ \begin{align&\quad x & {\rm{if\;}} \;x \ge 0\\&&&- x & {\rm{if \;\;} x < 0\end{align} \right.\] Using the same method as in the previous example, we see that the f chart coincides with the line \(y = x\) to the right of the y-axis and coincides with the line \(y = - x\) to the left of the y-axis Example- 7 Find a formula for the f function shown in figure - 17. : Line dia:0, 0 and (1, 1) is tilted \(m = 1\) and y-intercept \(b = 0\), in which case the equation is \(y = x\). Thus, for the part of chart f that joins (0,0) to (1, 1), we have \[f\left(x \right) = x\quad {\rm{if\;\; 0}} \le x \le {\rm{1}}\] The bus line (1, 1) and (2, 0) is tilted \(m = - 1\), so the point-tilt format is \[y - 0 = \left({ - 1} \1} \left({x - 2} \right)\quad {\rm{or \;\\}} y = 2 - x\] \[\,f\left(x \right) = 2 - x\quad {\rm{if \;\;}} 1 < x \le 2\] We also see that the f chart coincides with the x-axis for \(x > 2\). Putting this information together, we have the following three - track type for \(f\) : \[f\left(x \right) = \left\{ \begin{align}&x & & {\rm{if\quad }}0 \le x \le 1\\&&&&2 - x & & {\rm{if \quad}}1 < x \le 2\\&&&0 & & {\rm{if \quad }}x > 2\end{align} \right.\] TRY YOURSELF - I Q.1: An equilateral triangle is circled radius r. Find area A of the triangle as a function of r. Q.2: Let *(y = f\left(x \right)\) be such that \\begin{align}&\frac{{x^2}}}{{a^2}}} + \frac{{y^2}}}{{{b^2}}} = 1.\end{align}\)It is \f\left(x \right)) E.3: Find a formula for the function shown below : Q.4: A projectile is thrown at an initial speed u at an angle \(\theta \) to the horizontal. Allow \((x,y)\) to be its position in a given time t. Find (a) x as a function of t (b) y as a function of t (c) y as a function of x (d) of the distance r of the projectile from the source, as a function of t. Pronunciation: /ˈvɜr.t■k.k. la■n tʃst/ Explain A vertical line test is used to determine whether a relationship drawn in a chart is a function or not. To test a vertical line, carve the relationship, and then look at the chart. If anywhere place a vertical line through the chart at most once, then the relationship is a function. If any vertical line passes through the chart more than once, the relationship is not a function. Click on and drag it to change the image. Does the vertical line ever cross the chart more than once? Manipulation 1 - Vertical Line Test - Successful created with GeoGebra. Move the point to the left. Then move it slowly to the right. How many times does the red vertical line intersect the chart? Since there is not at least one vertical line that intersects more than one point, the chart represents a function. Click the blue spot of the shape and drag it to change the shape. Does the vertical line ever cross the chart more than once? Manipulation 2 - Vertical Line Test - Failure created with GeoGebra. Move the point to the left. Does the red vertical line intersect the chart? Now move the point in the middle of manipulation. Does the red vertical line intersect the chart? There are two purple incision points. Since there is at least one vertical line that intersects more than one point, the chart does not represent a function. McAdams Reports, David E. Dictionary of all mathematical words, vertical line test. 2nd class edition 20150108-4799968. pg 190. Life is a Problem LLC story. January 8, 2015. Buy the book McAdams, David E. Vertical Line Test. 12/21/2018. All Words of Mathematical Encyclopedia. Life is a Problem LLC story. . Review History 21/12/2018: The IPA process has been revised and corrected. (McAdams, David E.) 12/17/2018: Damaged links, updated license, new signage application, update to new GeoGebra app removed. (McAdams, David E.) 8/7/2018: Vocabulary links changed to WORDLINK format. (McAdams, David E.) 16/9/2008: Changed images to manipulators. (McAdams, David E.) 3/11/2008: Added vocabulary link to relationship. (McAdams, David E.) 7/12/2007: Original version. (McAdams, David E.) E.)