Chapter 3

Polynomial and
Rational Functions

Figure 3.1.1: drawing showing dimensions of gift box in example

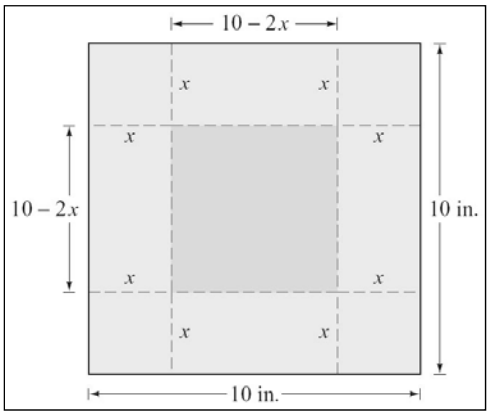

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Figure 3.1.2: illustration of graphs that are or are not polynomial functions

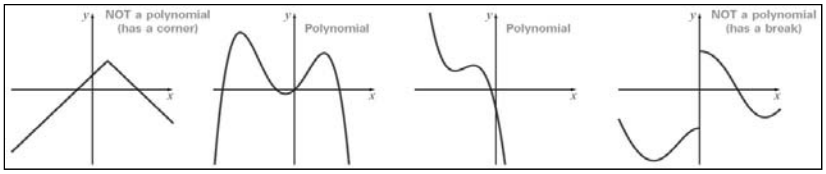

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Figure 3.1.3: graph of 2 polynomial functions

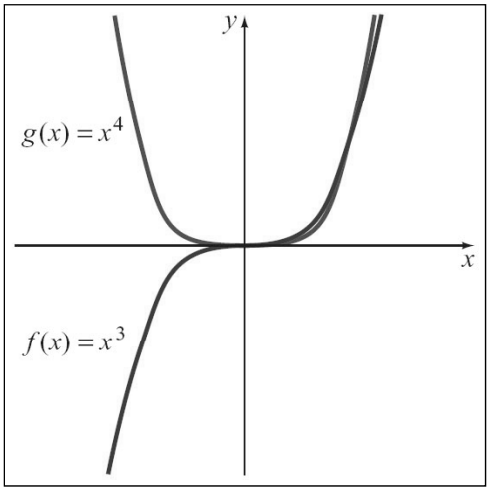

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Figure 3.1.4: graph of 2 polynomial functions, showing end behavior

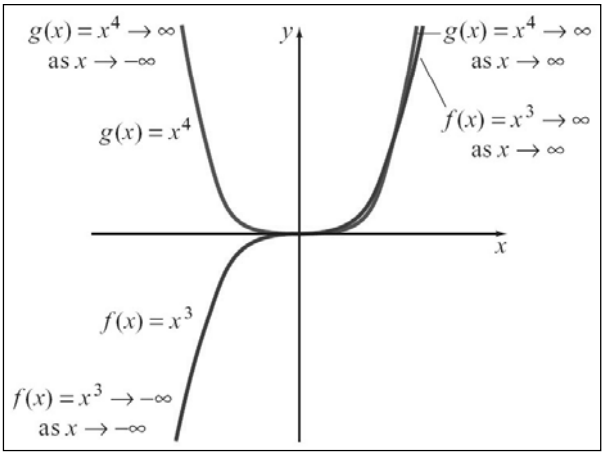

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Figure 3.1.5: illustration of general graph of odd one-term polynomial functions

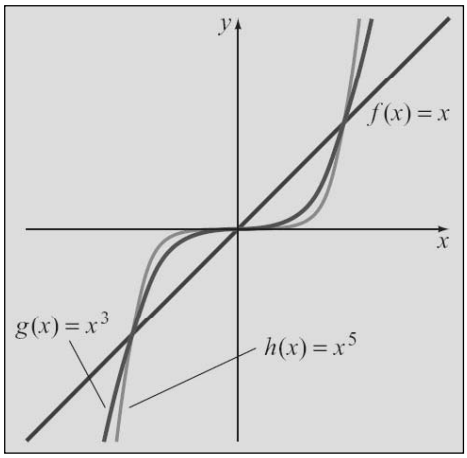

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Figure 3.1.6: illustration of general graph of even one-term polynomial functions

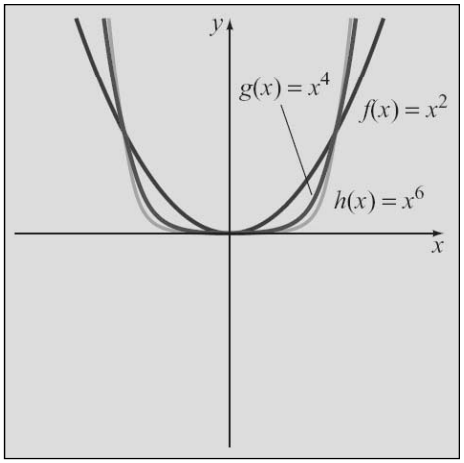

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Figure 3.1.7: graphs showing use of a horizontal shift to graph a polynomial function

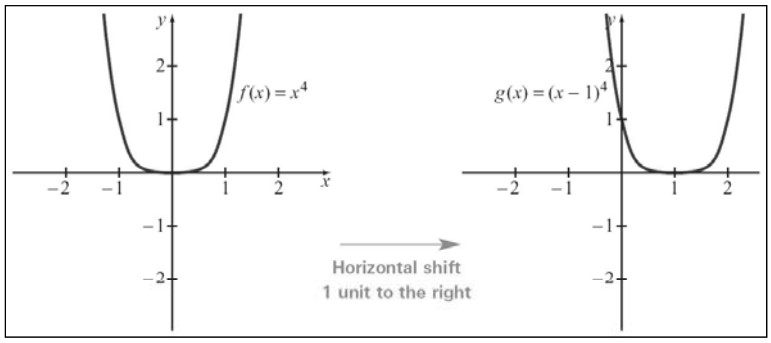

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Figure 3.1.8: graphs showing a series of transformations to graph a polynomial function

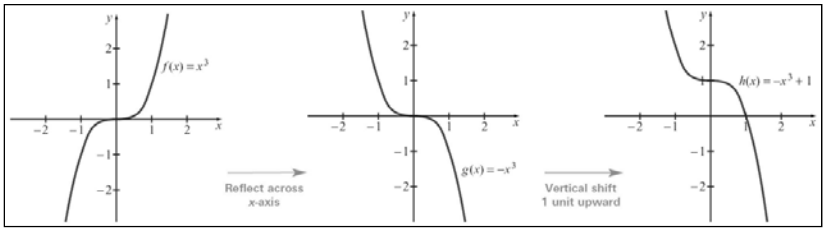

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Figure 3.1.9: graph of two polynomial functions, demonstrating that the highest term in the polynomial dominates the behavior of the graph for very large values of *x*

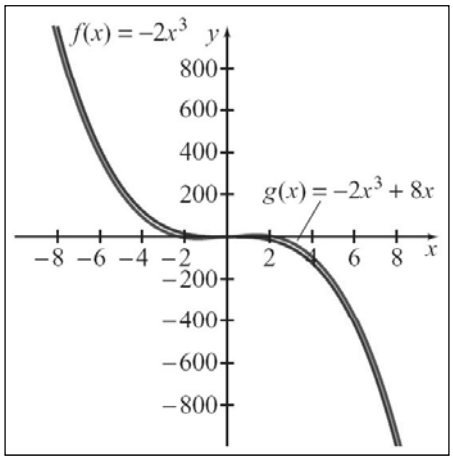

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Figure 3.1.10: 4 graphs illustrating end behavior of non-constant polynomials

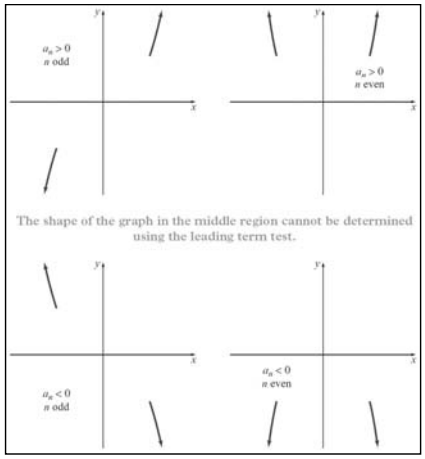

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Figure 3.1.11: 2 calculator screens illustrating how window settings affect the appearance, and usability, of polynomial graphs

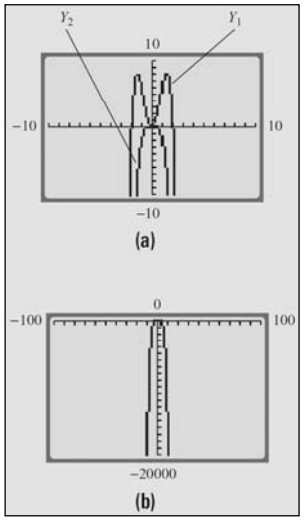

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Figure 3.1.12: start of the graph of a polynomial function, showing end behavior and *x*-intercepts

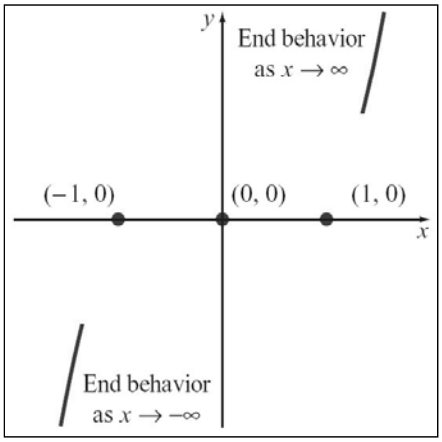

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Figure 3.1.13: number line showing where the value of *f*(*x*) (from previous figure) is positive or negative

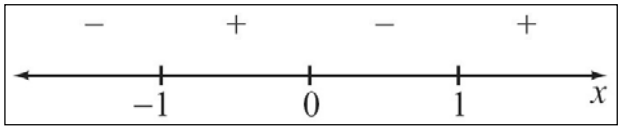

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Figure 3.1.14: middle and final stages in graph from previous figure

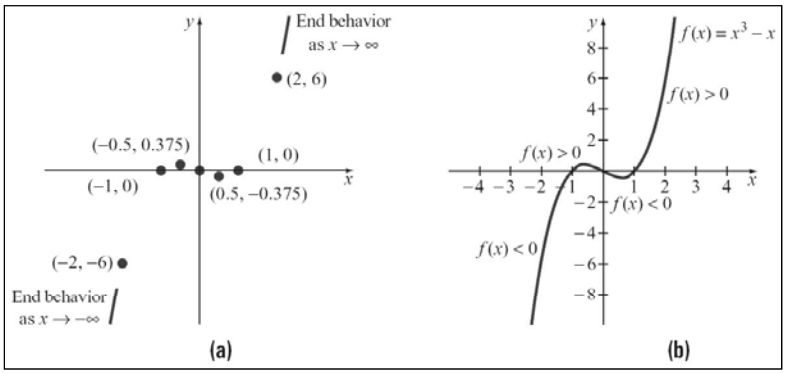

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Figure 3.1.15: *Dashed sections indicate that the function values are beyond realistic limits.* (Application problem, graph showing reasonable values for the answer.)

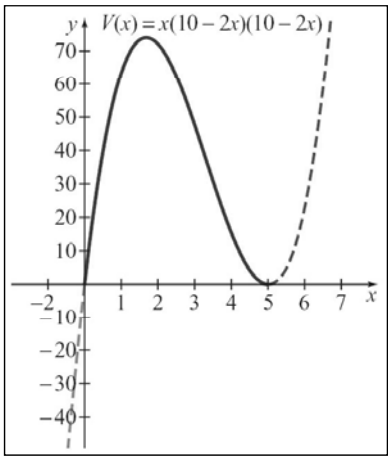

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Figure 3.2.1: illustration of multiplicity of zeros on a graph of a polynomial function

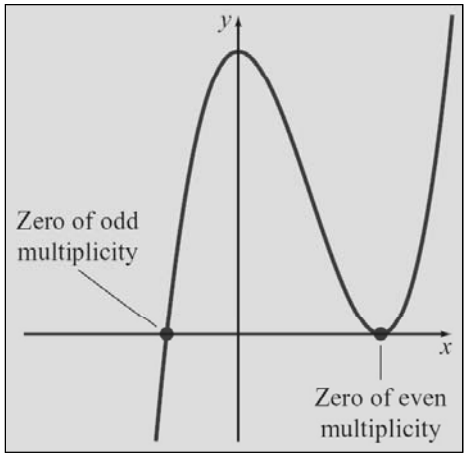

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Figure 3.2.2: example showing behavior of graph of a polynomial function for odd and even zeros

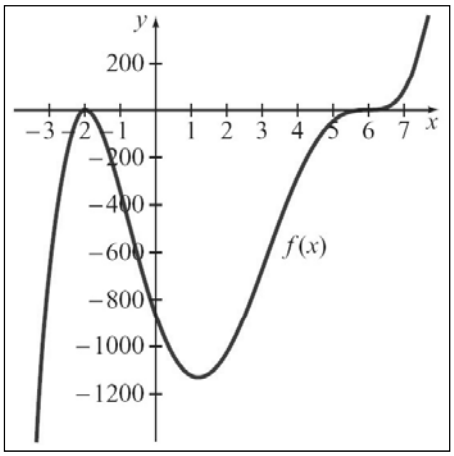

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Figure 3.2.3: example showing behavior of graph of a polynomial function for odd and even zeros

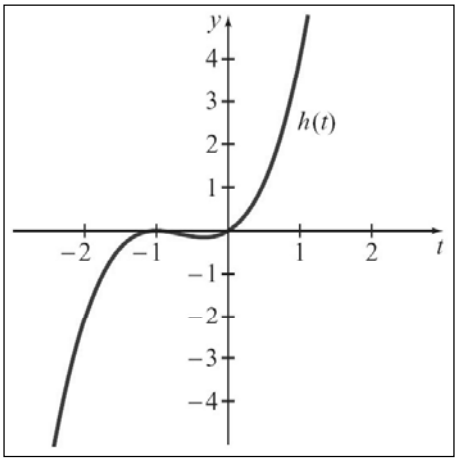

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Figure 3.2.4: graph of a polynomial function

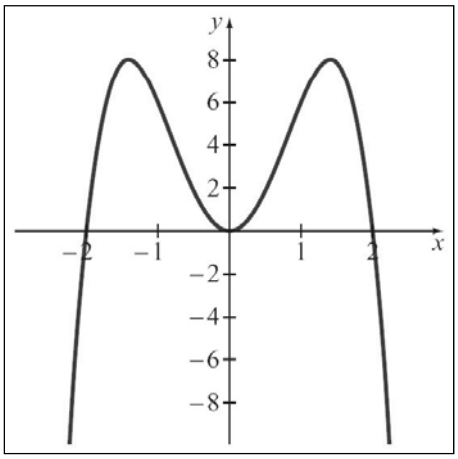

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Figure 3.2.5: calculator screen showing use of MAXIMUM and MINIMUM features to find local maxima and minima for polynomial functions

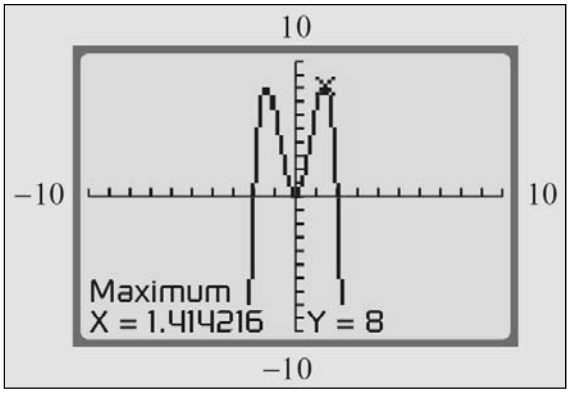

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Figure 3.2.6: calculator screen with scatter plot of data

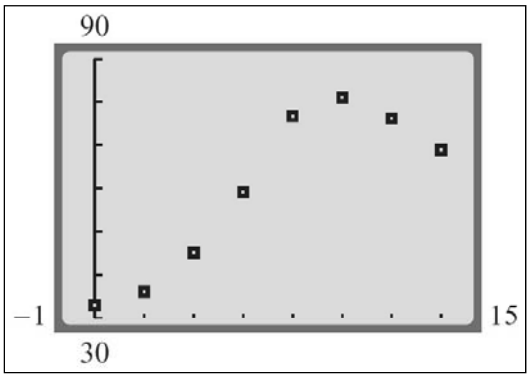

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Figure 3.2.7: 2 calculator screens showing cubic regression for data and graph of cubic model with scatter plot

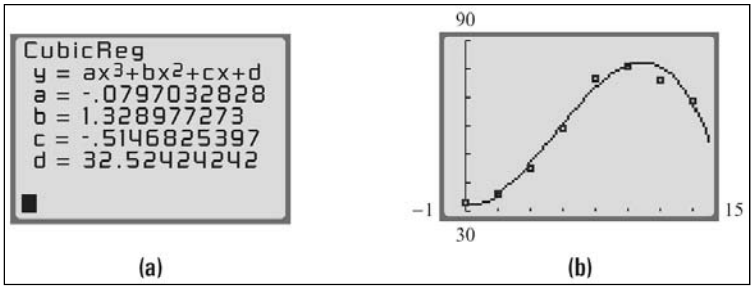

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Figure 3.4.1: graph of polynomial function showing real zeros

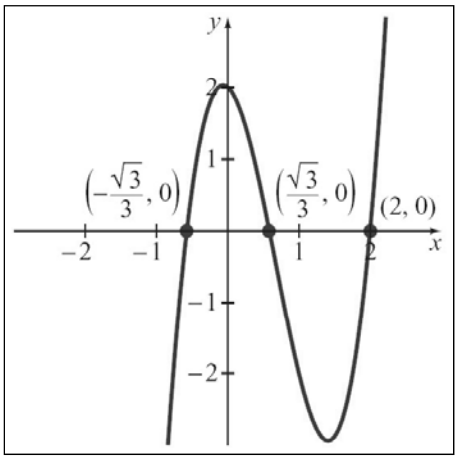

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Figure 3.4.2: calculator screen showing graph of a polynomial function, to find real zeros

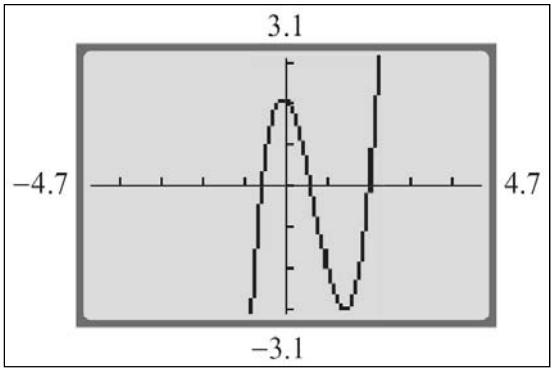

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Figure 3.4.3: calculator screen showing use of ZERO feature to find a real zero of a polynomial

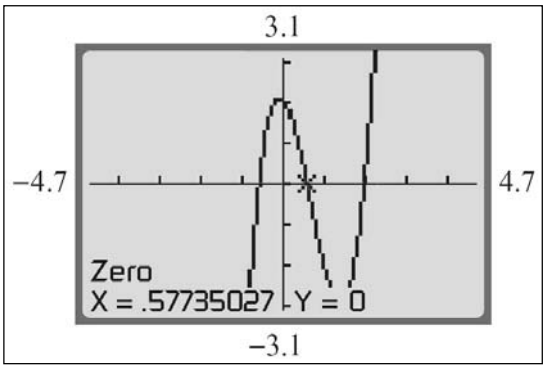

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Figure 3.4.4: calculator screen showing graph of a polynomial function, to find real zeros

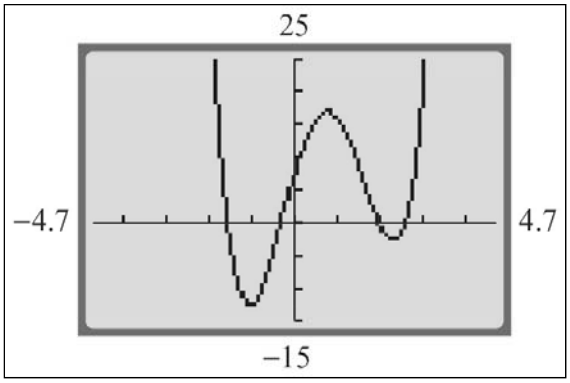

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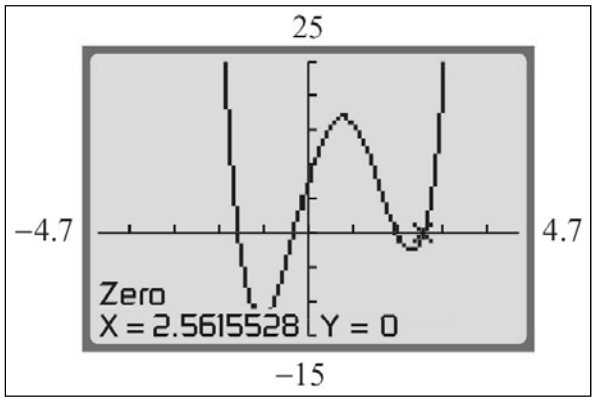
Figure 3.4.5: calculator screen showing use of ZERO feature to find a real zero of a polynomial



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graph of a rational function

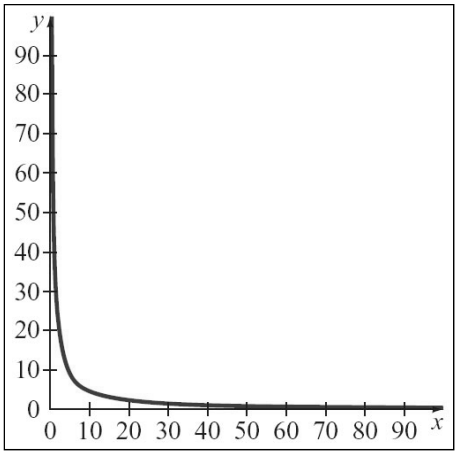

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Figure 3.6.1: graph of a rational function

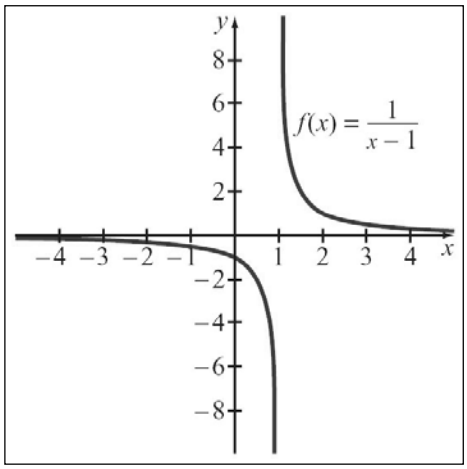

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Figure 3.6.2: graph of a rational function, showing vertical asymptote

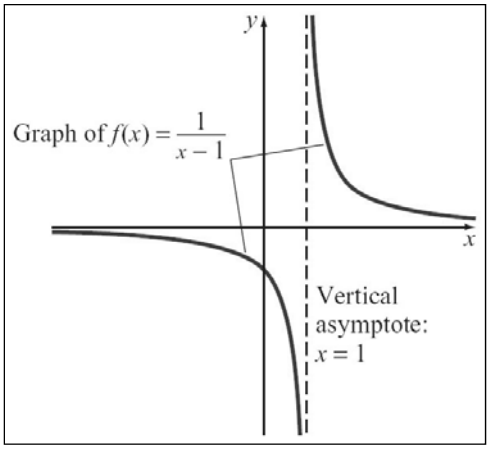

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Figure 3.6.3: 3 calculator screens showing the graph of a rational function in 3 different modes

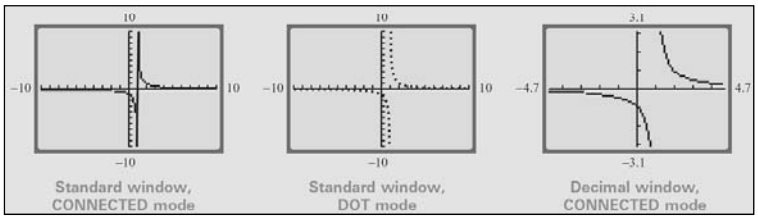

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Figure 3.6.4: initial graph showing end behavior (only) for a rational function

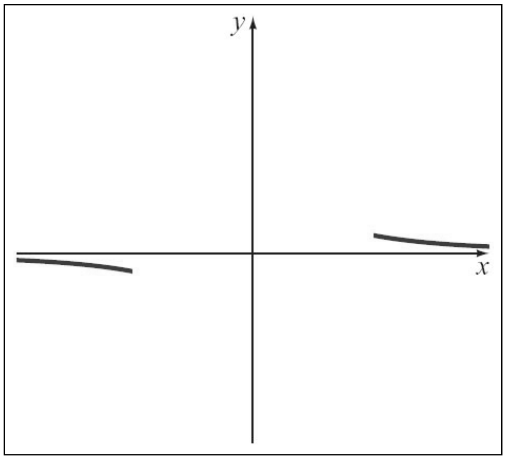

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Figure 3.6.5: initial graph showing end behavior (only) for a rational function

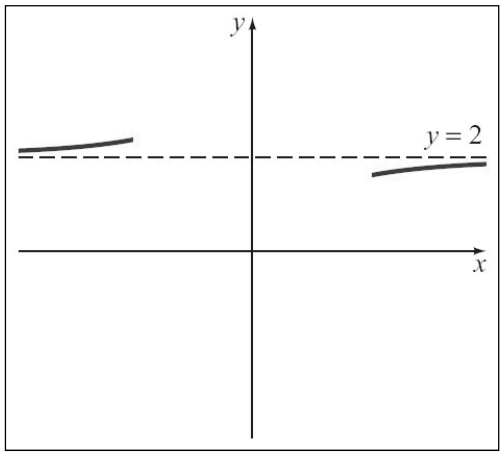

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Figure 3.6.6: initial graph showing end behavior, asymptotes, and intercepts (only) for a rational function

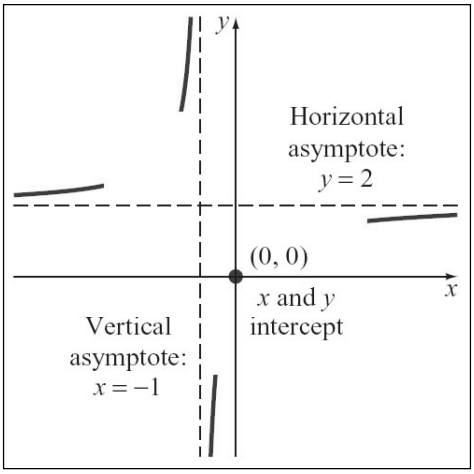

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Figure 3.6.7: calculator screen showing graph of a rational function, to confirm sketch

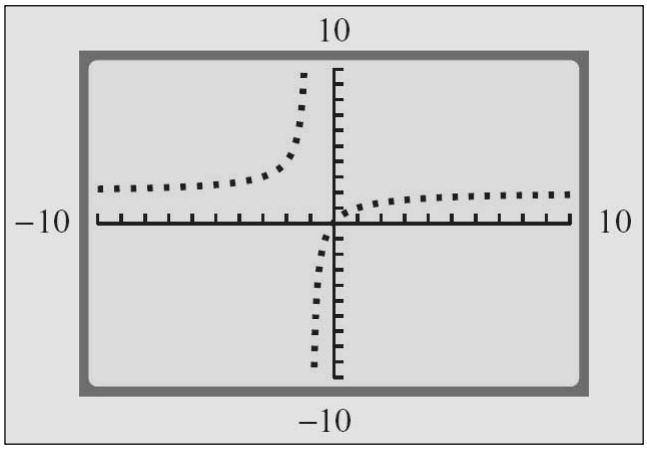

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Figure 3.6.8: graph of a rational function, showing asymptotes, intercepts, and several points on the graph

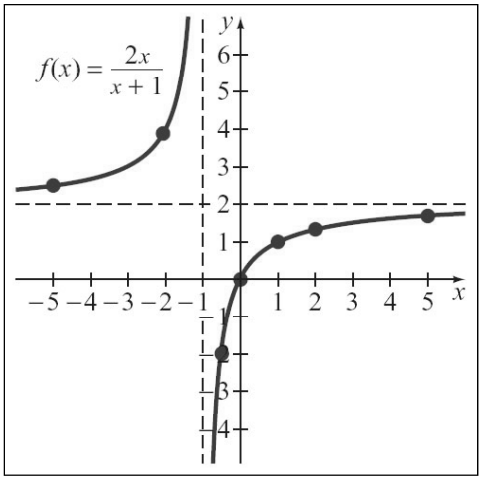

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Figure 3.6.9: initial graph showing end behavior and asymptotes (only) for a rational function

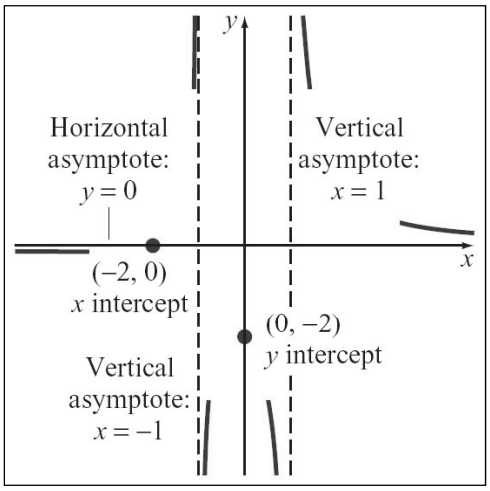

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Figure 3.6.10: graph of a rational function, showing asymptotes, intercepts, and several points on the graph

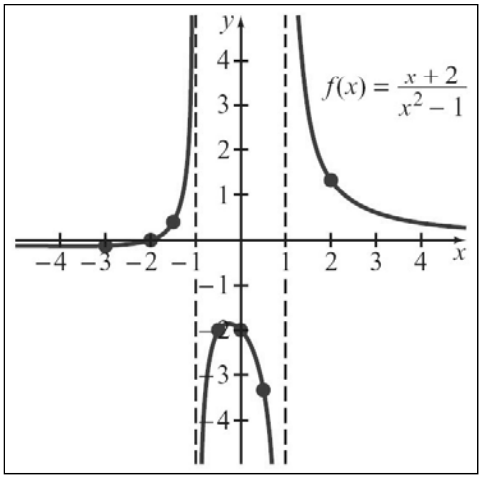

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Figure 3.6.11: graph of a rational function, with asymptotes

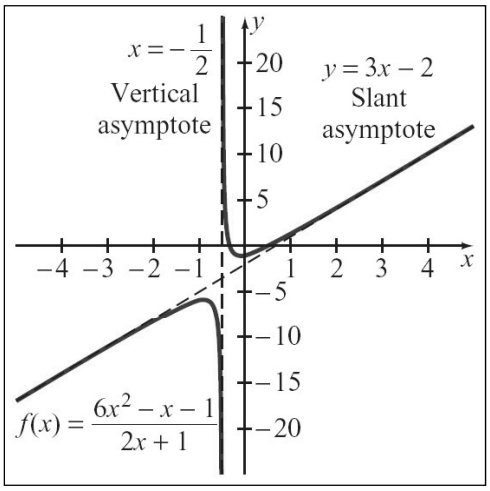

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Figure 3.6.12: graph of a rational function, with asymptotes and undefined point

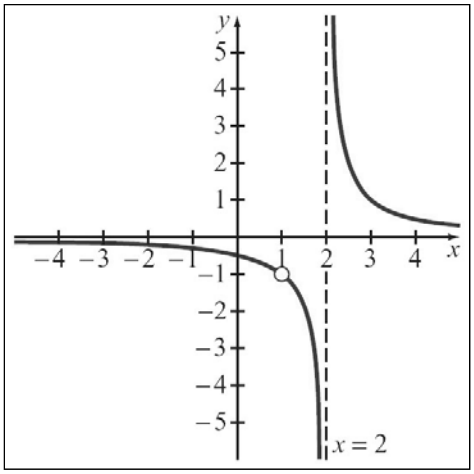

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Figure 3.7.1: graph of a polynomial function showing where *f(x)* is positive and negative

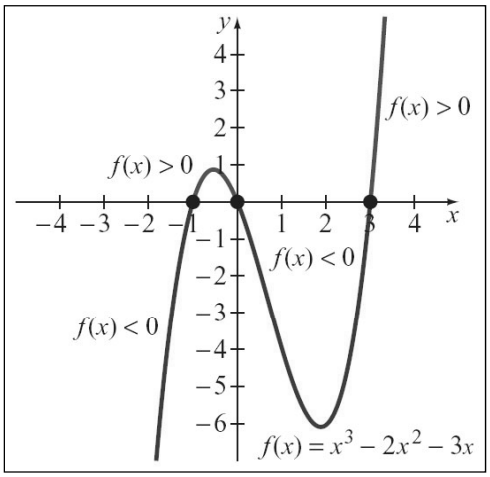

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Figure 3.7.2: calculator screen with graph of a rational function

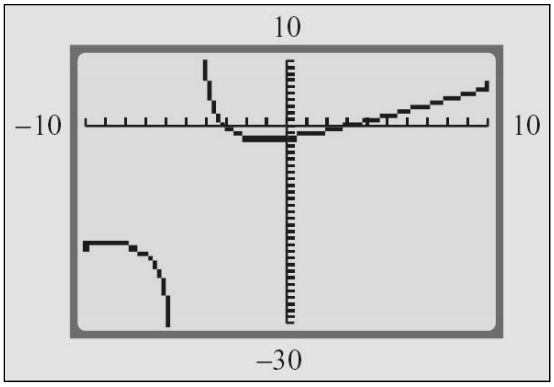

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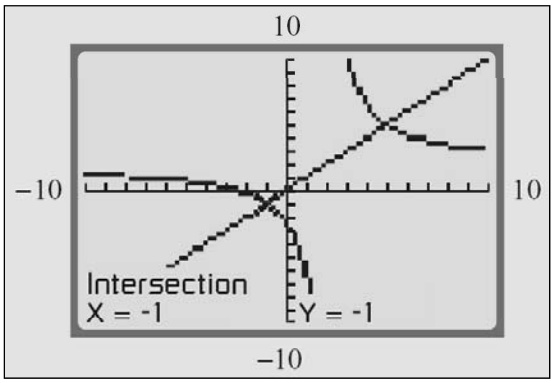
Figure 3.7.3: calculator screen showing graph of a rational function and INTERSECT feature, to solve rational inequality



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