The University of the State of New York
The State Education Department
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Guidelines for Graphing Calculator Use for Commencement-Level Mathematics

Introduction

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Frequently Asked Questions

1) Can I use a graphing calculator that can simplify radicals such as $\sqrt{2}$ or give exact trig values?
   -Yes. These features will be allowed.

2) Is there a list of approved calculators that can be used on the Math Regents Exams?
   -No. It is the responsibility of each district to make sure any graphing calculator to be used on a High School Mathematics Regents Exam adheres to the guidelines.

3) A company representative told me a specific calculator model can be used on Math Regents Exams. Can I assume the calculator is approved?
   -No. Although representatives may be helpful in providing explanations of the range of capabilities for a brand of calculator, it is the responsibility of each district to make sure any graphing calculator to be used on a High School Mathematics Regents Exams adhere to the guidelines.

4) My calculator has a Computer Algebra System (CAS). May I use this calculator for the Math Regents Exams?
   -You may ***not*** use this calculator unless there is a way to restrict the CAS features that are prohibited by the guidelines.

5) If I put my calculator in a test mode, does this ensure it is ready for the Math Regents Exams?
   -Not necessarily. Although this is generally a good practice, districts must maPret0 diy2T [(t)-262 (s

Calculator Tasks

When taking Mathematics Regents Examinations, some of the tasks students will be expected to perform using a graphing calculator are:

- Graphing functions in an appropriate viewing window
- Determining key features of functions
- Observing the table of values for a graphed equation
- Solving systems of equations
- Exploring changes and effects on the graph of parent functions
- Performing trigonometric calculations
- Determining a regression equation
- Determining a correlation coefficient
- Determining the standard deviation of a set of data
- Determining population percentages for a normal curve

Expectations for sketches and graphs

- Same-degree equations are labeled when graphed on the same set of axes (no deduction if the student fails to label only one graphed equation)
- To show the curvature of nonlinear functions, at least three points should be indicated on the graph or represented as a table of coordinate values
- Key features are correctly shown
- Scale is stated if not 1 to 1
- Use the full extent of the graph or provide arrows unless a domain is specified

If a student sketches a graph when a grid is not provided, the above criteria for sketches and graphs still apply.

Examples

The problems that follow illustrate what students should show when using a graphing calculator in order to be awarded the maximum points allowable on the scoring rubric for each constructed-

A-APR Understand the relationship between zeros and factors of polynomials

The student explored graphs of the form $(x-a)(x-b)(x-c)(x-d)$ on the graphing calculator and drew a sketch of a quartic function with zeros at -2, 2, 4, and -4. The student plotted 4 points, provided a correct shape for a quartic, and showed appropriate end behavior. The minima may be roughly drawn and the graph misses -2, 2, and 4 slightly, but credit should not be deducted for this sketch.

A-REI Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Albany begins the day with 5 inches of snow on the ground and Buffalo begins the same day with 2 inches of snow on the ground. Two snowstorms begin at the same time in Albany and Buffalo, snowing at a rate of 0.8 inches per hour in Albany and 1.4 inches per hour in Buffalo. The number of inches of snow on the ground in Albany and Buffalo during the course of these snowstorms are modeled by and , respectively.

Determine the number of hours that would pass before Albany and Buffalo have the same amount of snow on the ground. [The use of the grid below is optional.]

The student entered both equations into a graphing calculator and drew the graphs of both

F-BF Identify the effect on the graph of replacing by , , , and for specific values of (both positive and negative); find the value of given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

The function is given below.

2

Describe the effect on the graph of , if .

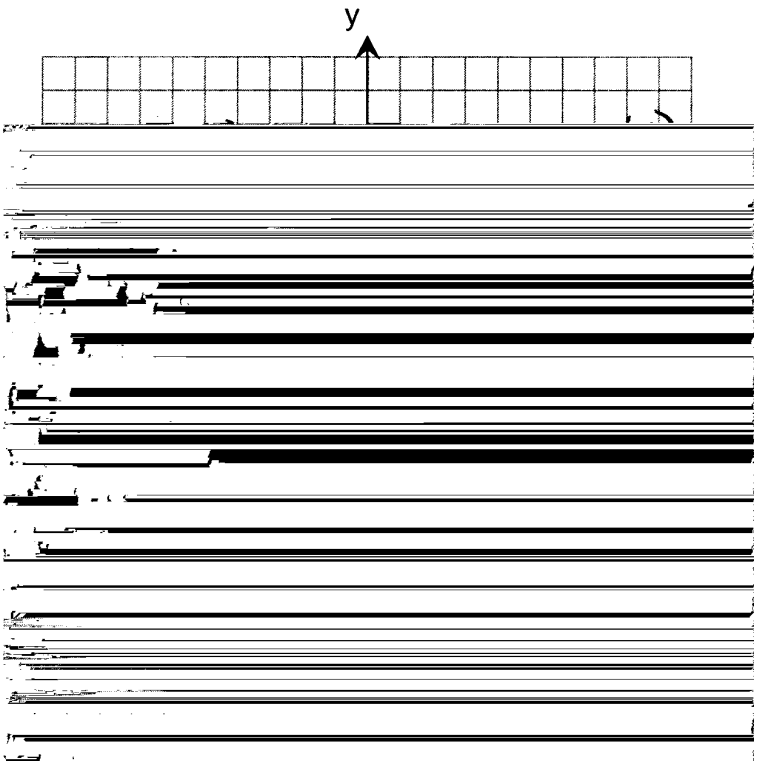
The graph f(x) moves five units to the right.

Show that the vertices of and support your description.

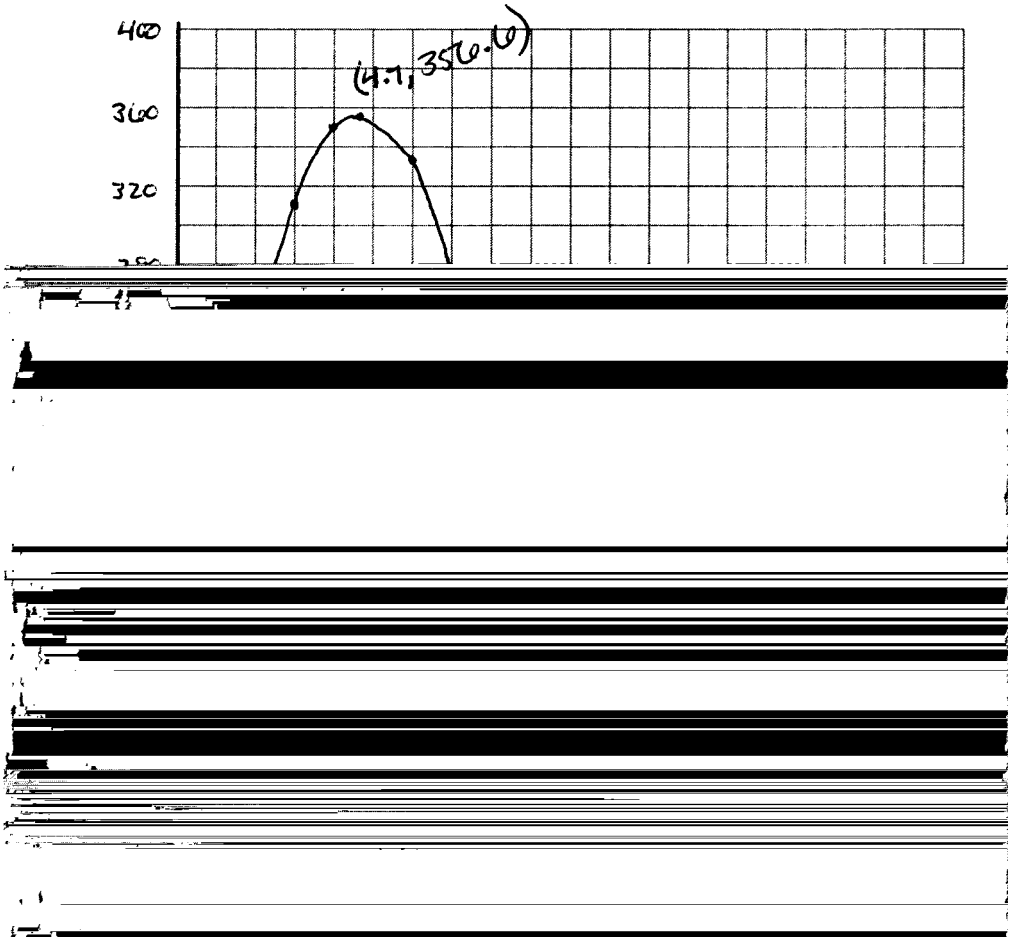
[The use of the set of axes below is optional.]

$(-1,-4) \rightarrow (4,-4)$

moves five units to the right



The student entered both functions in the graphing calculator and drew the graphs of and on the accompanying set of axes. The functions, roots, intercepts, and vertices were labeled. The student made a statement that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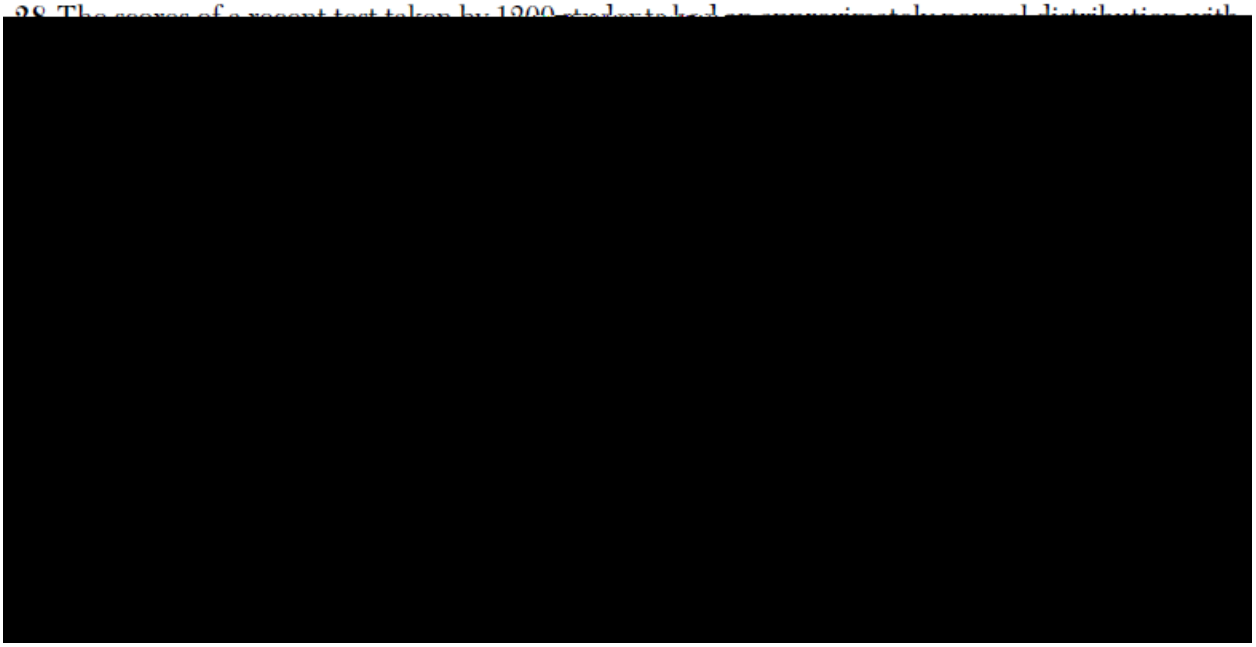
360
320
(4.7, 356.0)

S-ID Summarize, represent, and interpret data on a single count or measurement variable.



The student showed correct work in determining 941 students. While the item could be solved primarily using a graphing calculator feature, the student provided a sketch and listed calculations which clearly demonstrate the student's understanding of the problem to the rater.