ANSWERS ARE PROVIDED for #1 - #33. Teachers will need to make an answer key for questions #34 - #51.

#		
1	Mark keeps track of the number of customers he serves each hour at the coffee shop. His results are shown in the table below. Make a histogram that models this data.	

Time of Day	Number of Customers
10 A.M. to 11 A.M.	17
11 A.M. to 12 noon	4
12 noon to 1 P.M.	22
1 P.M. to 2 P.M.	25
2 P.M. to 3 P.M.	6

Standard: S.ID.1

Answer:

Customers at the Coffee Shop

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2 Karisa counted the number of raisins in twenty snack size boxes and found that the number of raisins in each box was normally distributed with a mean of 112 raisins and standard deviation of 8 raisins. What is the probability that a box contains between 104 and 112 raisins?

Standard: S.ID.4   **Answer:** 34%

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3 Tucker needs to find out the number of defective light bulbs on a truck. He noted that 4 out of 46 light bulbs were defective from a randomly selected box. Based on these results, about how many light bulbs can he expect to be defective in a truckload of 12,500 light bulbs?

Standard: S.IC.1   **Answer:** about 1087 bulbs

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4 A music teacher wants to conduct a survey to determine how many students plan to attend a school concert. How should she collect a good random sample to give the MOST accurate survey results? Explain your answer.

Standard: S.IC.3   **Answer:** Answers may vary

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5 A sample survey of 2,450 voters revealed that 53% planned to vote for candidate A in an upcoming election. The poll had a 3% margin of error. If there are 205,000 total voters, what is the likely range of voters intending to vote for candidate A?

Standard: S.IC.4   **Answer:** between 102,500 and 114,800 voters

---

6 A survey was conducted at Keller Middle School to determine the favorite subject of students. The results of the survey are shown in the graph below.

Favorite Subject of Students

The total number of students surveyed was 300. How many more students picked English over Math?

Standard: S.IC.6   **Answer:** 9 students

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7 What is the coefficient of n^2?

$(n^2 - 3) - (7 - n + 3n^2) - (4n + 1 - 8n^2)$

Standard: A.SS.E1a   **Answer:** 6

---

8 Kristen is 2 times as old as her younger brother, Luke. Which equation represents their ages, in years, if Kristen's age is k and Luke's age is l?

Standard: A.CED.2	**Answer:** $l = \frac{1}{2} k$ or $k = 2l$

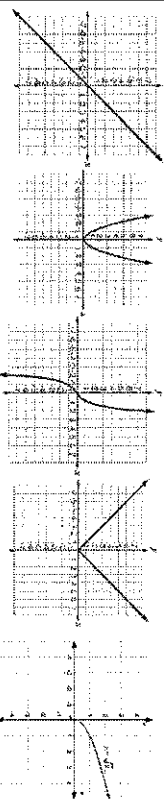**9** Sketch the graph of each of the parent functions listed below:

$$y = x \qquad y = x^2 \qquad y = x^3 \qquad y = |x| \qquad y = \sqrt{x}$$
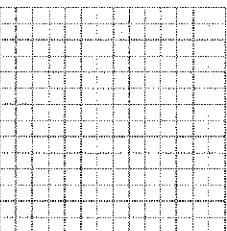
Answers:

Standard: F.IF.7	**Answer: See Above box**

10 A club is selling hats and jackets as a fundraiser. Their budget is $1500 and they want to order at least 250 items. They must buy at least as many hats as they buy jackets. Each hat costs $5 and each jacket costs $8. Let h = number of hats and j = number of jackets.

A. Write a system of inequalities to represent the situation.

B. Graph the inequalities.

C. If the club buys 150 hats and 100 jackets, will the conditions be satisfied?

Standard: A.CED.3	**Answers:** A. $h + j \geq 250$ $5h + 8j \leq 1500$ $h \geq j$

C. No, the cost will be $1550, which is greater than $1500

11 Jamie is building a rectangular dog pen in her backyard with 80 feet of fencing. The pen's area is given by $A(x) = x(40 - x)$, where x is the length of fencing measured in feet along one side of the pen. Which inequality represents the domain of this function given the context it represents?

Standard: F.IF.5	**Answer:** $0 < x < 40$

12 Determine the quadratic equation that has zeros that are $x = -2$ and $x = 5$.

Standard: A-CED.1	**Answer:** $y = x^2 - 3x - 10$

13 Use a polynomial identity to show an equivalent expression for $(u + v)^2$.

Standard: A.APR.4	**Answer:** $u^2 + 2uv + v^2$

14 Heather graphed the following equations.

Equation 1: $y = \frac{4}{3}x - 2$

Equation 2: $12x - 9y = 27$

Equation 3: $2x + 4y = -8$

a) How do the graphs of equations 1 and 2 compare? What is their point of intersection?

b) How do the graphs of equations 1 and 3 compare? What is their point of intersection?

Use words, numbers, and/or pictures to show your work.

Standard: F.IF.9	**Answer: Below**

a) The lines have the same slope, no point of intersection.
The slope of the line for Equation 1 is $\frac{4}{3}$. Solve Equation 2 for y:
$-9y = -12x + 27$; $y = \frac{4}{3}x - 3$. The slope of the line for Equation 2 is $\frac{4}{3}$. Since the lines have the same slope and different y-intercepts, they are parallel and do not intersect.

b) The lines have different slopes, intersect at $(0, -2)$.
Solve Equation 3 for y: $4y = -2x - 8$; $y = -\frac{1}{2}x - 2$. The slope is $-\frac{1}{2}$. Since the slopes of the lines are not the same, the lines are not parallel. Therefore, they

intersect. Since the *y*-intercepts of both lines are −2, they must intersect at the point $(0,-2)$.

Standard: F-IF.5 | **Answer:** Domain: $(-\infty,\infty), x \neq -2$ Range: $(-\infty,\infty), y \neq 4$

---

15 Factor the following expression.

$$12x^2 - 60x + 75$$

Standard: A.SSE.2 | **Answer:** $3(2x-5)^2$

---

16 Determine the end behavior of the equation below. Explain how you made your decision.
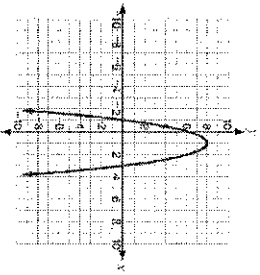
$$f(x) = -3x^7 + 4x^5 - 12x^3 + 9x^2 - 16$$

As $x \to -\infty, f(x) \to$ ___

As $x \to +\infty, f(x) \to$ ___

Standard: F.IF7.C

• Negative lead coefficient, odd exponent. This pattern produces: as $x \to -\infty, f(x) \to \infty$ and $x \to +\infty, f(x) \to -\infty$

---

17 What is the domain of the function graphed below?
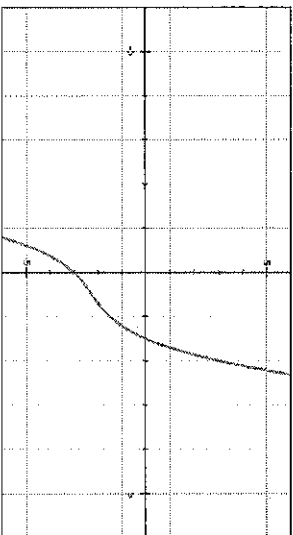

Standard: F-IF.5 | **Answer:** $(-\infty, \infty)$

---

18 What are the domain and range of $(x) = \frac{4x+1}{x-2}$?

---

19 Write the expression $5(x-1)(x-3)$ in standard form. What is the coefficient of x?

Standard: A-SSE.1.a | **Answer:** -20

---

20 Below is the graph of a cubic polynomial.

What is the average rate of change between x-values of 0 and 2?

Standard: F.IF.6 (Poly) | **Answer:** 3

---

21 Let

$$f(x) = \frac{x+1}{x^2 - 5x - 14}$$

What are all the vertical asymptotes of the graph of $f(x)$?

Standard: F.IF.4 | **Answer:** $x = 7$ and $x = -2$

---

22 Given: $P(x) = x^5 + 4x^3 - 5x$

• Find all the zeros of (x) .
• How many real zeros does $P(x)$ have, and what are they?
• How many total zeros over the complex numbers does $P(x)$ have, and what are they?

Standard: N.CN9(+) | **Answer:** $0, \pm 1, \pm i\sqrt{5}$
• $P(x)$ has three real zeros:

	0 and ±1. • $P(x)$ has five zeros over the complex plane: $\pm i\sqrt{5}$, 0 , and ± 1
23	What is the sum of $-5\sqrt{-81}$ and $6\sqrt{-81}$? **Answer:** $9i$
	Standard:N.CN.2
24	Which solutions satisfy the equation $x^2 = 2x - 6$? **Answer:** $1 \pm i\sqrt{5}$
	Standard:N.CN.7
25	Write $\sqrt{-25} + 2$ as a complex number in the form $a + bi$. **Answer:** $2 + 5i$
	Standard:N.CN.1
26	Which polynomial can be factored over the complex numbers as $4(2x+i)(2x-i)$? **Answer:** $16x^2 + 4$
	Standard: N.CN.8(+)
27	A polynomial function has zeros at: $x = 2, -4$ and $5i$. • How many total zeros over the complex numbers does the function have, and what are they? • Write an equation that represents this function. • What is the degree of this function? Use words, numbers, and/or pictures to show your work. Write your answer(s) on the paper provided **Standard: N.CN9(+)** • **4 zeros** $(2, -4, 5i, and - 5i)$ • $f(x) = (x - 2)(x + 4)(x - 5i)(x + 5i)$ • **Degree of 4**

28	Two functions are defined as $f(x) = 3x^4 + 2x^3 - 7x^2 - 3$ and $g(x) = x - 2$. A. Use synthetic division to determine if $g(x)$ is a factor of $f(x)$. B. Find $f(2)$. C. What can be concluded about the relationship of these functions?
	Standard: A.APR.2 **Answer:** A. Remainder 33; B. $f(2) = 33$; C. $g(x)$ is not a factor of $f(x)$
29	Find the zeros of the function $f(x) = 2x^2 + x - 3$ D. Write $f(x)$ in factored form. E. Find the roots. F. Find the maximum or minimum value. G. State the axis of symmetry.
	Standard: F.IF.8a **Answer:** A. $f(x) = (2x + 3)(x - 1)$ B. $x = -\frac{3}{2}, 1$ C. Vertex (-0.25, -3.125); minimum value is -3.125 D. Axis of Symmetry: $x = -0.25$

30

Four downhill skiers recently performed multiple trials on the same run. The table below shows the mean times and standard deviations of each skier.

Mean Times for Skiers

	Mean Trial Time	Standard Deviation
May	88.12	2.83
Latisha	88.46	1.29
Sofia	91.51	0.98
Regina	89.89	3.82

A ski coach has to choose one of the skiers to compete in a tournament. The coach wants to choose the skier who most consistently gets a time below 90 seconds. Based on the information in the table, which skier is the BEST choice?

Standard: S1.2.3, S-ID.2   **Answer: LATISHA**

31

Determine the end behavior of the equation below using limit notation. Explain how you made your decision.

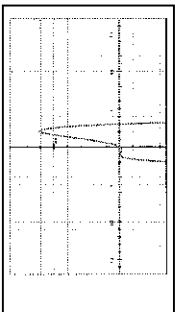$$y = 3x^8 + 4x^5 - 12x^3 + 9x^2 - 16$$

Standard: F.IF7.C

- This pattern produces:
  as $x \to -\infty, f(x) \to \infty$ and
  as $x \to +\infty, f(x) \to +\infty$

32

Use the function: $f(x) = x(x + 3)(x - 1)^2$ to answer the following questions.

a). Identify the zero(s).
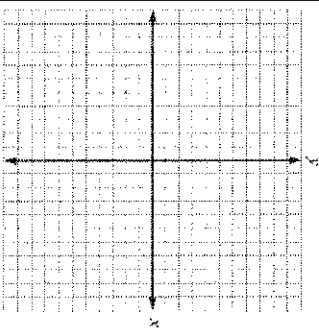
b). Identify the $y -$ intercept.

c). Graph the function.

Standard: A.APR.3
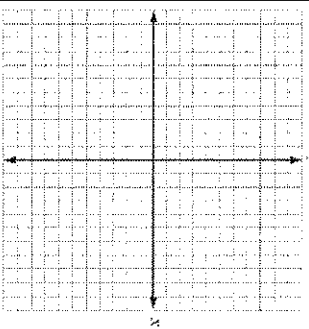
Answer: a). $x = 0$, -3, 1 multi 2
b). (0, 0)
c).

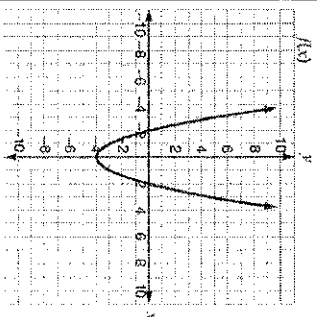Connie is working with the graph of $f(x) = x^2 - 4$.

- Graph $f(x) = x^2 - 4$.

- Find a function, $g(x)$, that opens in the same direction as $f(x)$ but that represents a narrower parabola. Explain your work.

- Graph $g(x)$.

Use words, numbers, and/or pictures to show your work.

Standard: F.BF.3 | **Answer: SEE BELOW**

One possible answer is $g(x) = 2x^2 - 4$.

The function $g(x) = ax^2 + bx + c$, with any $a > 1$ and any real values for b and c, is correct. This is correct because increasing the absolute value of the coefficient of x^2 makes the graph of the parabola narrower, and a positive coefficient will keep the parabola opening upward.
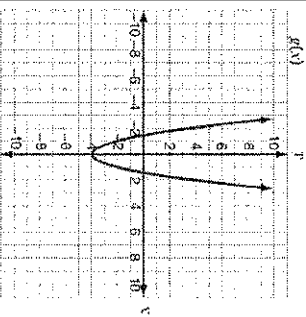
The function given as an answer to the second question should be graphed in the $g(x)$ coordinate plane. The equation that is graphed there now is $g(x) = 2x^2 - 4$.

Mid-Term Review

34. Large = 16
    Small = 20

35). 1st Hr: Mean = 53.2 med = 50, mode = 43
    4th Hr: mean = 69.8, med = 54, no mode

36). 68% - 76%

37). $j = 25$ $S = \frac{1}{2}j$

38). 2 degrees per hour

39) $x = -4, \ x = -9$
    roots, solutions

40). a). $8 + 17i$
     b). $-4 - 3i$
     c). $58 - 62i$

41). a). $(3x - 5)(9x^2 + 15x + 25)$
     b). $(4x + 2)(16x^2 - 8x + 4)$
     c). $(4x + 3y)^2$
     d). $3(x^2 + 4x + 5)$

42) $y > -5$ or $(-5, \infty)$

43). No solution; parallel lines.

44). $(5, 3)$

45). a) Carl
     b). Angela
     c). A range = 60; C range = 55
     d). Carl

Mid-Term Review

46) a) 95%
    b). 652 people

47). $\frac{512}{1548}$ = .331 = 33.1%

48). a) false
    b). true

49). a). True
    b). False

50) a) $x = 1$ multi 2, 2, 3
    b). Inc: $(1, 1.5) + (2.5, \infty)$
        Dec: $(-\infty, 1) + (1.5, 2.5)$
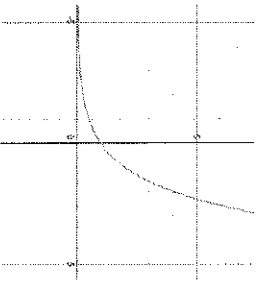   d). 1
    c). 2

51). $2x + 3y = 64$
     $x + y = 28$

     $x = 20, y = 8$

ANSWERS ARE PROVIDED for #1 - #33. Teachers will need to make an answer key for questions #34 - #51.
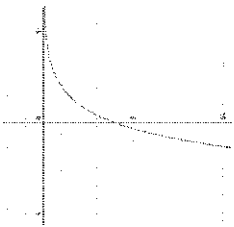
Answers #52 - #60

52.

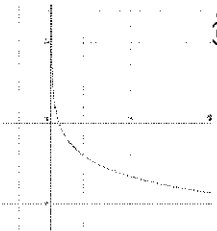
Domain: All Real   Range: $y > 0$
y-intercept: (0,1)
What family of functions is this? Exponential
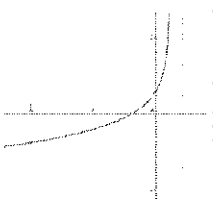What is the maximum value over the domain $-2 \le x \le 2$? 4

53. $f(x) = 4(2)^x$

$f(x) = 4(2)^{x-3}$

$f(x) = (-3)(2)^x + 1$

54.   Decay, percent change = 67%

      Growth, percent change = 75%

      Decay, percent change = 20%

55.   Growth: $b > 1$

      Decay: $0 < b < 1$

56. $P = 250(1 - .03)^x$

      $P = 215$

57. $T = 12,000(.75)^n$

58.

59. $f(x) = 2x + 5$ and $f(x + 1) = f(x) + 2$

60. $f(x) = 4\left(\frac{1}{2}\right)^x$ and $f(x + 1) = f(x) * \frac{1}{2}$