1. Find the sum.

Sum	

$$(x + 3)(2x^5) + 7x^5$$

2. Find the product.

Product	

$$(k + 8)(k - 11)$$

3. Find the sum.

Sum	

$$-2x(x + 9) + (x + 8)(7 - 3x)$$

4. Find the difference.

Difference	

$$\frac{2}{3}(7y^3 - 9y) - \left(\frac{11}{3}y^3 - \frac{2}{3}y^2 + \frac{17}{3}\right)$$

5. Find the product.

Product	

$$(2x + 9)(5x - 8)$$

6. Find the product.

Product	

$$(x + 7)^2$$

7. Find the product.

Product	

$$\frac{4}{5}b^6(11b - 15)$$

8. Find the quotient where $h \neq 0$.

Quotient	

$$(24h^9 + 32h^{15}) \div (-8h^3)$$

9. Find the product.

Product	

$$(x - 4)(x - 7)$$

10. Find the quotient where $w \neq 0$ and $y \neq 0$.

Quotient	

$$\frac{16w^5y^{11} + 28w^2y^5 - 36w^3y^3}{4wy^3}$$

Factor each completely. Show your work for partial credit.

11. $25x^2 - 49y^2$

12. $6x^3 - 18x^2 + 5x - 15$

Factored Form	

Factored Form	

13. $24x^5y^6z^4 + 54x^8y^4z^9$

14. $16x^2 + 72x + 81$

Factored Form	

Factored Form	

15. $x^2 - 5x - 14$

16. $9x^2 + 21x + 10$

Factored Form	

Factored Form	

17. $2x^2 + x - 36$

18. $x^2 + 7x - 30$

Factored Form		**Factored Form**	

19. $x^6 - 25$

20. $x^2 + 20x + 99$

Factored Form		**Factored Form**	

21. $5x^2 - 4x + 20x^3 - 1$

22. $24x^2y - 16xy + 56y^3$

Factored Form		**Factored Form**	

23. $x^2 - 10x + 21$

24. $8x^3y^2 + 56x^7y^5 + 32x^6y^4$

Factored Form		**Factored Form**	

25. $x^2 + 16x + 64$

26. $8x^2 + 22x - 21$

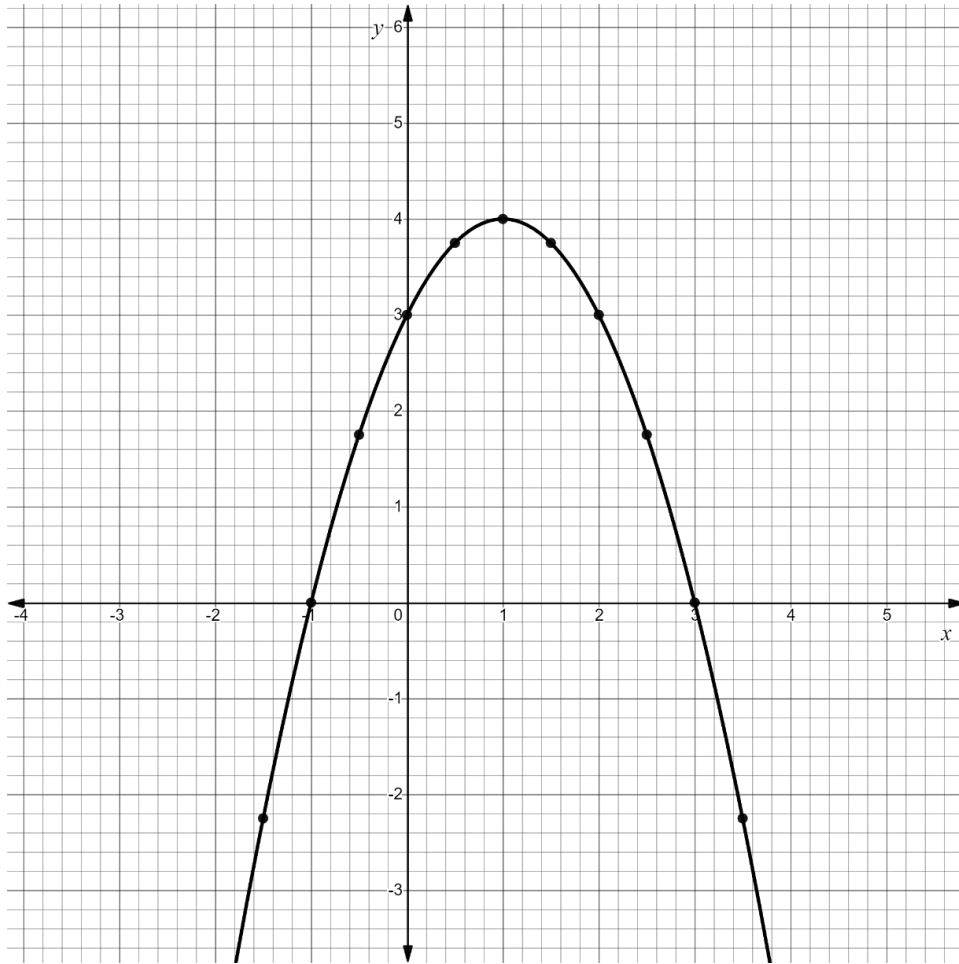| **Factored Form**		**Factored Form**	

27. An expression is shown.

$8x^3 - 12x^2 - 2x + 3$

Select all of the equivalent expressions.

☐ $2x(4x^2 - 6x - 1)$
☐ $2x^2(4x - 6x - 1)$
☐ $4x^2(2x - 3) - 1(2x + 3)$
☐ $4x^2(2x - 3) - 1(2x - 3)$
☐ $(2x - 3)(2x - 1)(2x + 1)$

28.   A quadratic function is graphed on the coordinate grid.

Complete the table.

Name	Key Feature	Name	Key Feature
x-intercepts		increasing	
y-intercept		decreasing	
vertex		positive	
axis of symmetry		negative	
domain		range	

29.   Rewrite the equation $y = 4x^2 + 40x + 89$ in vertex form.

Vertex Form	

30.   Write the quadratic equation $y = x^2 - 6x - 16$ in factored form.

Factored Form	

31.   A table of values for a quadratic function is shown.

x	1	6	8	10	15	17
y	251	31	-1	-1	139	251

Complete each statement.

As $x \to -\infty$, $y \to$

As $x \to \infty$, $y \to$

32.   A researcher found that for the years 2013 to 2019, the equation, $y = -0.4(x - 3)^2 + 42$, models the average gas mileage of new vehicles sold in Switzerland, where x is the number of years since 2013 and y is the average gas mileage, in miles per gallon (mpg).
During what year was the average gas mileage for new vehicles sold in Switzerland the greatest?

Year	

33.   A mathematician used data of the average gas mileage of new vehicles sold in Greece for the years 2010 to 2019 to create a quadratic function that models the data, where x is the number of years since 2010 and y is the average gas mileage, in miles per gallon (mpg). Some of the values are shown in the table of values.

x	0	3	5	7	10	14.574
y	40	52.6	55	52.6	40	0

During what years was the average gas mileage for new vehicles sold in Greece decreasing?

Years	

34.   A social scientist researches the prevalence of undernourishment, as a share of the population. Undernourishment is the main hunger indicator used by the United Nation's Food and Agriculture Organization. The social scientist measures the share of the population which has a caloric (dietary energy) intake which is insufficient to meet the minimum energy requirements defined as necessary for a given population. The Pacific Ocean is home for several small countries such as Samoa, Tonga, and Fiji.

The social scientist found the equation, $y = 0.2(x + 1)(x - 14)$, models the relative change as a percentage, y, of the undernourished population of the small countries in the Pacific Ocean x years since 2001.

a. Determine the x-intercepts of the equation $y = 0.2(x + 1)(x - 14)$.

x-intercepts	

b. Interpret the x-intercepts of the equation $y = 0.2(x + 1)(x - 14)$ for the given context.

Interpretation of the x-intercepts	

35. The graph of the function,
$$G(x) = -\frac{1}{4}x^2 + 3x + 37,$$
models the average gas mileage of new vehicles sold in Sweden for the years 2010 to 2019, where x is the number of years since 2010 and G is the average gas mileage, in miles per gallon (mpg), is shown.
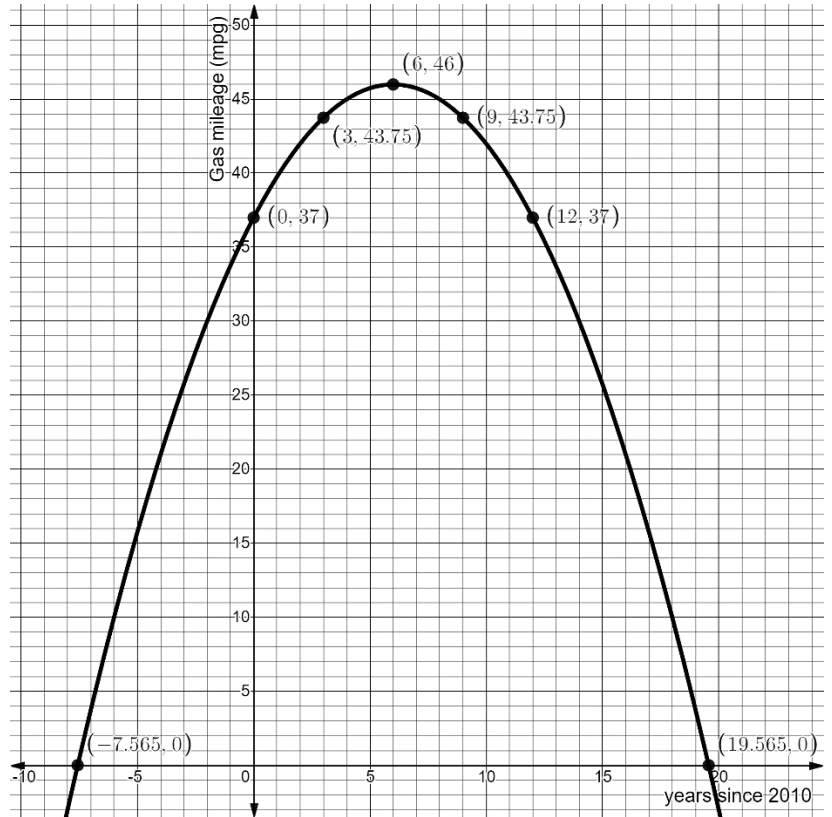
Complete the table by naming the key feature, if any, the coordinate represents and by determining if the coordinate makes sense for the context. Justify your answer.

	Coordinate	Key Feature (write none if it is not a key feature)	Does the coordinate make sense for the context?	Justification
a.	$(-7.565, 0)$		☐ No ☐ Yes	
b.	$(0, 37)$		☐ No ☐ Yes	
c.	$(6, 46)$		☐ No ☐ Yes	

d. Determine the reasonable constraints for the context. Write the constraints in set-builder notation.

Constraints	

36. Write the equation for a quadratic function that has x-intercepts $(-2,0)$ and $(7,0)$ and passes through the point $(5,-42)$.

   a. Write the equation for the quadratic function in factored form. Show your work in the space provided.

Work	
Factored Form	

   b. Rewrite the equation for the quadratic function that has x-intercepts $(-2,0)$ and $(7,0)$ and passes through the point $(5,-42)$ in standard form. Show your work in the space provided.
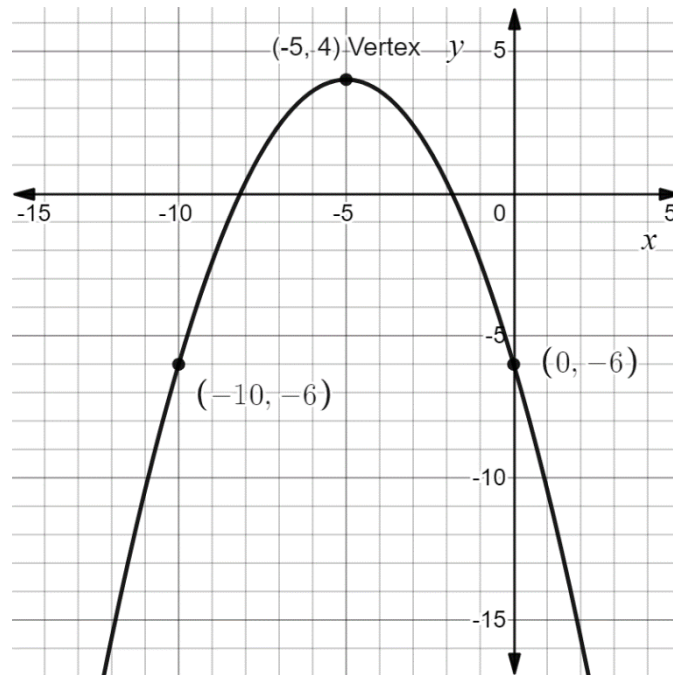
Work	
Standard Form	

37. A quadratic function is graphed on the coordinate grid. The vertex and two points equidistant from the vertex are labeled.

Write the equation for the quadratic function graphed in vertex form.

Work	
Vertex Form	

38. A table of values for a quadratic function is shown.

x	−3	1	3	5	9
y	−44	84	100	84	−44

    a. Write the equation in vertex form for the quadratic function using the table.

Work	
Vertex Form	

    b. Rewrite the equation for the quadratic function in the table in standard form. Show your work in the space provided.

Work	
Standard Form	

39. The US government monitors the consumption of different products. The table shows y, the amount of ice cream consumed in millions of pounds, for x years since 2010.

x	0	1	2	3	4	5	6	7	8
y	4,354	4,222	4,114	4,030	3,970	3,934	3,922	3,934	3,970

Write the quadratic equation, in any form, for the quadratic function that models the amount of ice cream consumed, in millions of pounds, since 2010.

Work	
Equation	

Solve each equation. Show your work in the space provided.

40. $x^2 - 4x - 12 = 0$

Work	
Solutions	$x =$ $x =$

41. $-5(x + 4)^2 + 19 = -6$

Work	
Solutions	$x =$ $x =$

42. $2x^2 + 12x + 15 = 0$

Work	
Solutions	$x =$ $x =$

43. $x^2 - 2x - 28 = 7$

Work	
Solutions	$x =$ $x =$

44.   A data scientist is comparing real estate market trends in the
southern United States for the years 2005 to 2020. The equation,
$y = 6(x - 8)^2 + 192$, represents the number of housing units sold, y, in
thousands, for each year since 2005, x.

a.   Write the constraints for the real estate market in the southern
United States. Show your work or explain how you determined
the constraint.

Variable	Constraint	Work or Explanation
x		
y		

b.   Determine when the number of housing units sold in the southern
United States is 216,000. Show your work.

Work	
Year(s)	

45.   The US government monitors the consumption of different products. The table shows y, the amount of ice cream consumed, in millions of pounds, for x years since 2010.

x	0	1	2	3	4	5	6	7	8
y	4,354	4,222	4,114	4,030	3,970	3,934	3,922	3,934	3,970

The quadratic equation that models the amount of ice cream consumed, in millions of pounds, since 2010 is shown.

$$y = 12(x - 6)^2 + 3922$$

Determine when the amount of ice cream consumed in the United States would be 5,650 millions of pounds.

Work	
Year(s)	