



وزارة التربية والتعليم
MINISTRY OF EDUCATION

الهيكل – Exam Guide

Trimester 1 – Mathematics

G12 – General – Reveal

Al Rawdah Al Sharqiah New Common School

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1. Graph Quadratic Functions Example 1 Page 4, Ex 1-4 Page 9

Example 1 Graph a Quadratic Function by Using a Table

Graph $f(x) = x^2 + 2x - 3$. State the domain and range.

Step 1 Analyze the function.

For $f(x) = x^2 + 2x - 3$. $a = 1$, $b = 2$, and $c = -3$.

c is the y -intercept, so the y -intercept is -3 .

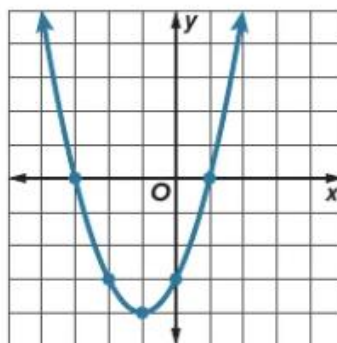
Find the axis of symmetry.

$$\begin{aligned} x &= -\frac{b}{2a} && \text{Equation of the axis of symmetry} \\ &= -\frac{2}{2(1)} && a = 1, b = 2 \\ &= -1 && \text{Simplify.} \end{aligned}$$

The equation of the axis of symmetry is $x = -1$, so the x -coordinate of the vertex is -1 . Because $a > 0$, the vertex is a minimum.

Step 2 Graph the function.

x	$x^2 + 2x - 3$	$(x, f(x))$
-3	$(-3)^2 + 2(-3) - 3$	$(-3, 0)$
-2	$(-2)^2 + 2(-2) - 3$	$(-2, -3)$
-1	$(-1)^2 + 2(-1) - 3$	$(-1, -4)$
0	$(0)^2 + 2(0) - 3$	$(0, -3)$
1	$(1)^2 + 2(1) - 3$	$(3, 0)$



Step 3 Analyze the graph.

The parabola extends to positive and negative infinity, so the domain is all real numbers. The range is $\{y \mid y \geq -4\}$.



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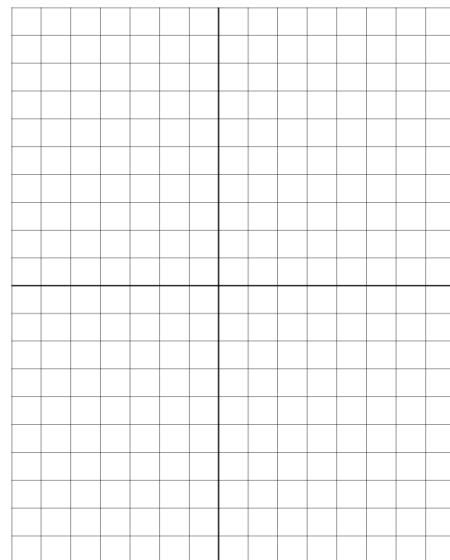
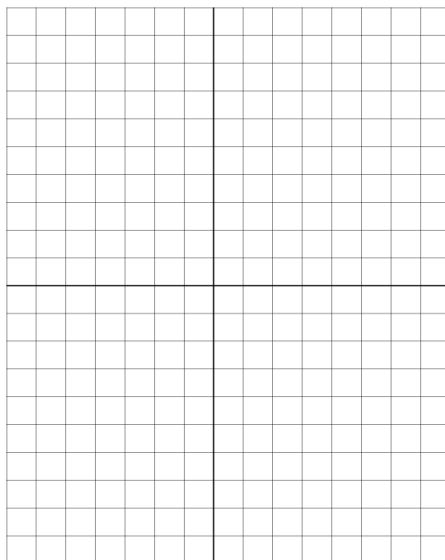
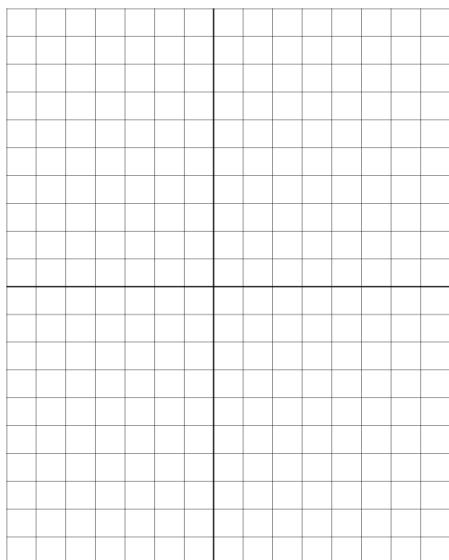
Graph each function. Then state the domain and range.

1. $f(x) = x^2 + 6x + 8$

2. $f(x) = -x^2 - 2x + 2$

3. $f(x) = 2x^2 - 4x + 3$

C





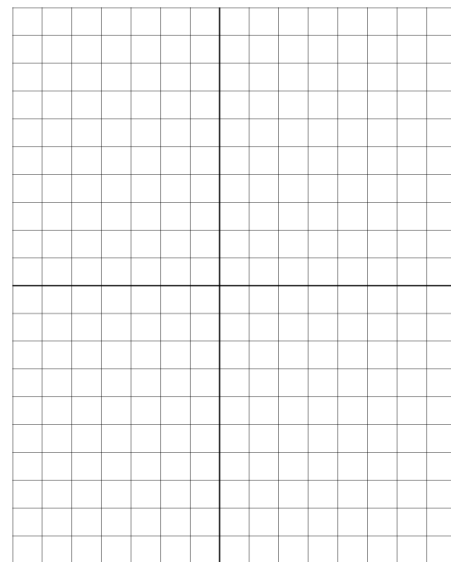
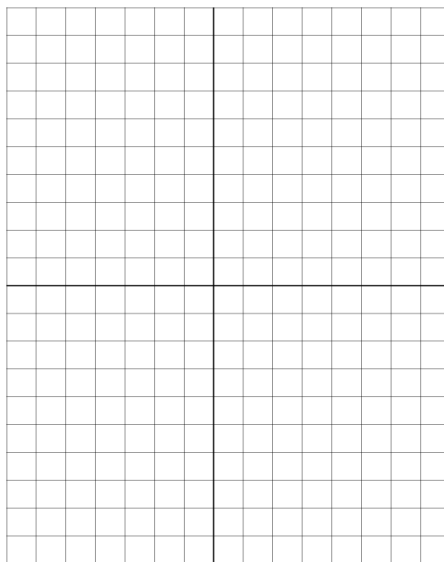
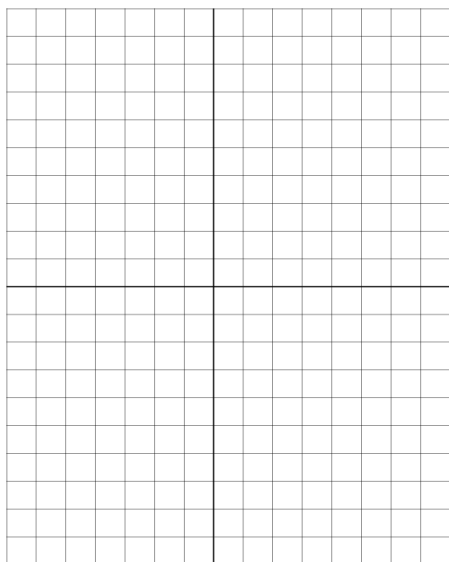
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4. $f(x) = -2x^2$

5. $f(x) = x^2 - 4x + 4$

6. $f(x) = x^2 - 6x + 8$





2. Solve quadratic equations by graphing. Ex(4-12) page 17

Solve each equation by graphing.

4. $x^2 - 10x + 21 = 0$

5. $4x^2 + 4x + 1 = 0$

6. $x^2 + x - 6 = 0$

7. $x^2 + 2x - 3 = 0$

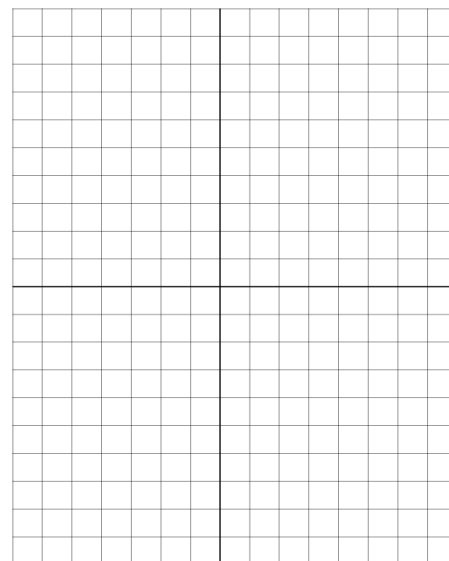
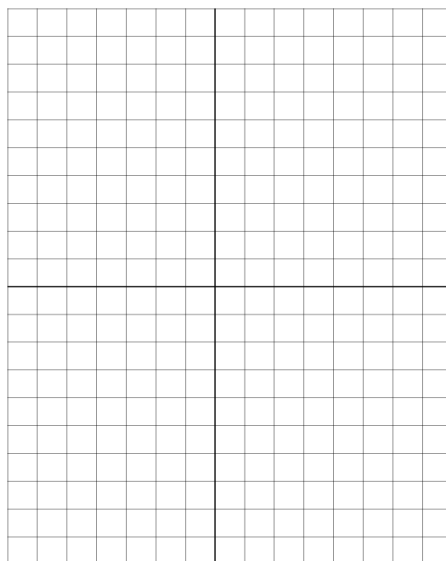
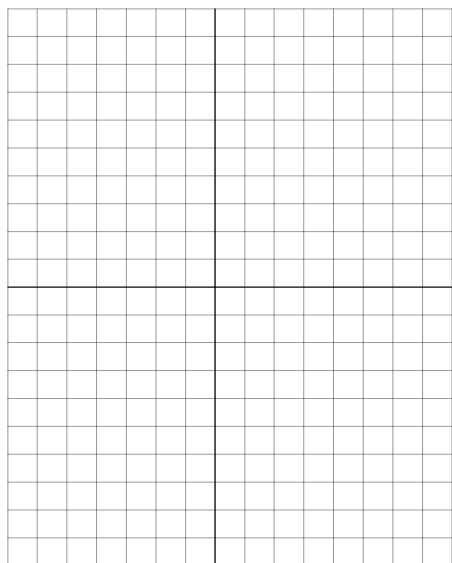
8. $-x^2 - 6x - 9 = 0$

9. $x^2 - 6x + 5 = 0$

10. $x^2 + 2x + 3 = 0$

11. $x^2 - 3x - 10 = 0$

12. $-x^2 - 8x - 16 = 0$





3. Solve Quadratic Equations by Factoring. Example 1,2,4 Page 27,28,29

Example 1 Factor by Using the Distributive Property

Solve $12x^2 - 2x = x$ by factoring. Check your solution.

$$12x^2 - 2x = x$$

Original equation

$$12x^2 - 3x = 0$$

Subtract x from each side.

$$3x(4x) - 3x(1) = 0$$

Factor the GCF.

$$3x(4x - 1) = 0$$

Distributive Property

$$3x = 0 \text{ or } 4x - 1 = 0$$

Zero Product Property

$$x = 0 \quad x = \frac{1}{4}$$

Solve.

Example 2 Factor a Trinomial

Solve $x^2 - 6x - 9 = 18$ by factoring. Check your solution.

$$x^2 - 6x - 9 = 18$$

Original equation

$$x^2 - 6x - 27 = 0$$

Subtract 18 from each side.

$$(x + 3)(x - 9) = 0$$

Factor the trinomial.

$$x + 3 = 0 \text{ or } x - 9 = 0$$

Zero Product Property

$$x = -3 \quad x = 9$$

Solve.



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Example 4 Factor a Trinomial Where a is Not 1

Solve $3x^2 + 5x + 15 = 17$ by factoring. Check your solution.

$$3x^2 + 5x + 15 = 17$$

Original equation

$$3x^2 + 5x - 2 = 0$$

Subtract 17 from each side.

$$(3x - 1)(x + 2) = 0$$

Factor the trinomial.

$$3x - 1 = 0 \text{ or } x + 2 = 0$$

Zero Product Property

$$x = \frac{1}{3} \quad x = -2$$

Solve.



4. Complete the square in quadratic expressions to solve quadratic equations.

Example 4 Page 35

Example 4 Complete the Square

Find the value of c that makes $x^2 - 7x + c$ a perfect square. Then write the expression as a perfect square trinomial.

Step 1 Find one half of -7 . $\frac{-7}{2} = -3.5$

Step 2 Square the result from Step 1. $(-3.5)^2 = 12.25$

Step 3 Add the result from Step 2 to $x^2 - 7x$. $x^2 - 7x + 12.25$

The expression $x^2 - 7x + 12.25$ can be written as $(x - 3.5)^2$.



5. Complete the square in quadratic expressions to solve quadratic equations. Example 5 Page 35

Example 5 Solve by Completing the Square

Solve $x^2 + 18x - 4 = 0$ by completing the square.

$$x^2 + 18x - 4 = 0$$

Original equation

$$x^2 + 18x = 4$$

Add 4 to each side.

$$x^2 + 18x + 81 = 4 + 81$$

Add $\left(\frac{b}{2}\right)^2$ to each side.

$$(x + 9)^2 = 85$$

Factor.

$$x + 9 = \pm\sqrt{85}$$

Square Root Property

$$x = -9 \pm \sqrt{85}$$

Subtract 9 from each side.

$$x = -9 + \sqrt{85} \text{ or}$$

Write as two equations.

$$x = -9 - \sqrt{85}$$

$$x \approx 0.22, \text{ or } -18.22$$

Simplify.

The solution set is $\left\{x \mid x = -9 - \sqrt{85}, -9 + \sqrt{85}\right\}$.

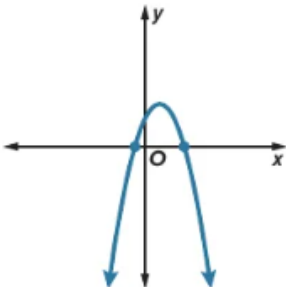
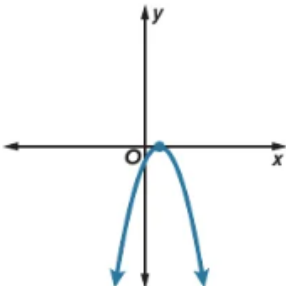
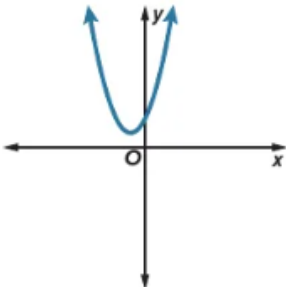
6. Determine the number and type of roots of a quadratic equation page 45

Learn Using the Discriminant

In the Quadratic Formula, the **discriminant** is the expression under the radical sign, $b^2 - 4ac$. The value of the discriminant can be used to determine the number and type of roots of a quadratic equation.

Key Concept • Discriminant

Consider $ax^2 + bx + c = 0$, where a , b , and c are rational numbers and $a \neq 0$.

Value of Discriminant	Type and Number of Roots	Example of Graph of Related Function
$b^2 - 4ac > 0$; $b^2 - 4ac$ is a perfect square.	2 real, rational roots	
$b^2 - 4ac > 0$; $b^2 - 4ac$ is not a perfect square.	2 real, irrational roots	
$b^2 - 4ac = 0$	1 real rational root	
$b^2 - 4ac < 0$	2 complex roots	

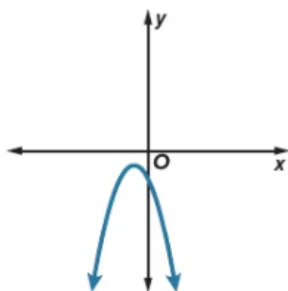


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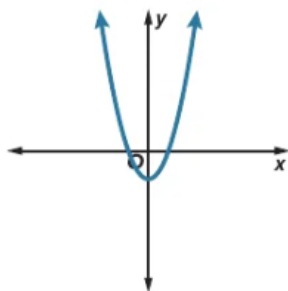
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REGULARITY Describe the discriminant of the related equation of each graph. Then determine the type and number of roots.

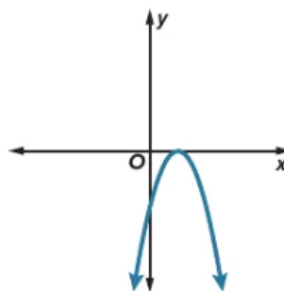
36.



37.



38.



Use the discriminant to describe the number and type of roots for each equation. Then solve each equation by using the Quadratic Formula.

39. $4x^2 - 4x + 17 = 0$

40. $8x - 1 = 4x^2$

41. $7x^2 - 5x = 0$

42. $x^2 + 10x + 24 = 0$

43. $x^2 - 11x + 24 = 0$

44. $12x^2 + 9x + 1 = 0$



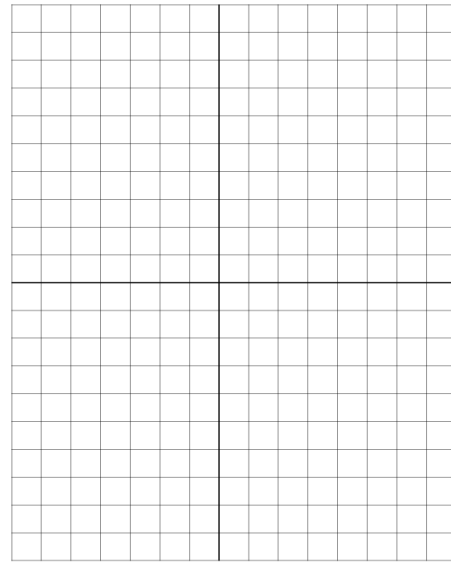
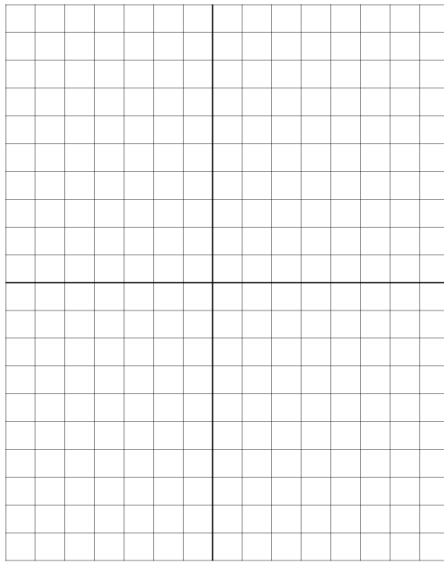
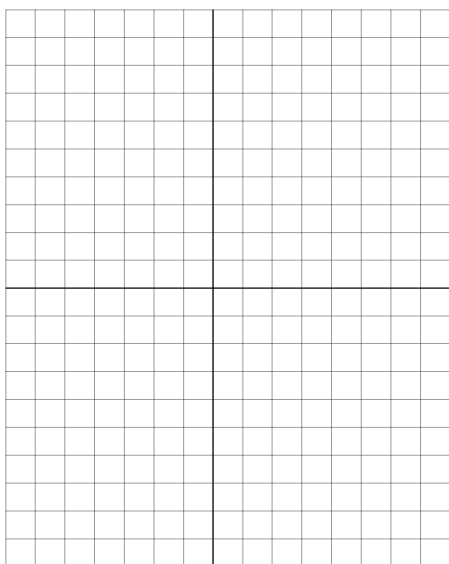
7. Graph quadratic inequalities in two variables. Ex 4-9 Page 55

Ex 37-39 Page 56

4. $y \leq x^2 + 4$

5. $y < 2x^2 - 4x - 2$

6. $-x^2 + 12x - 36 > y$

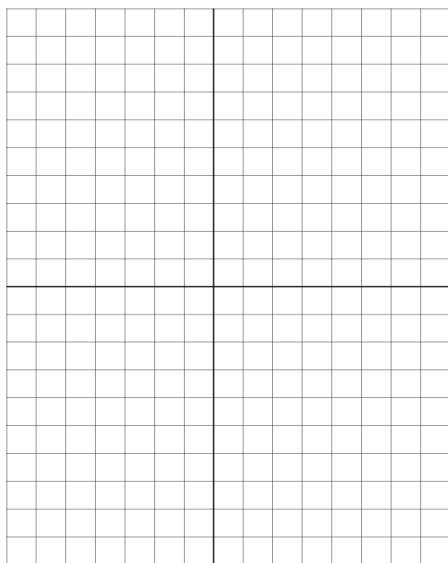




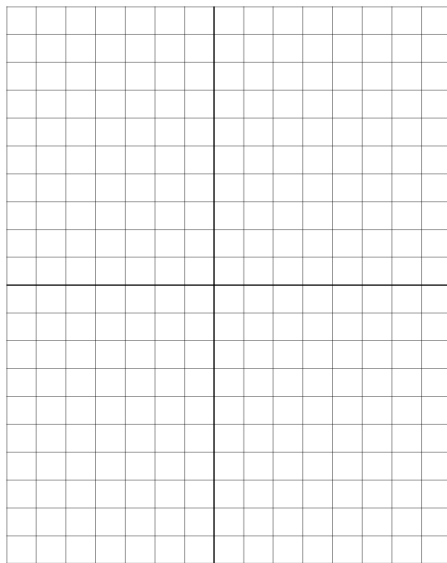
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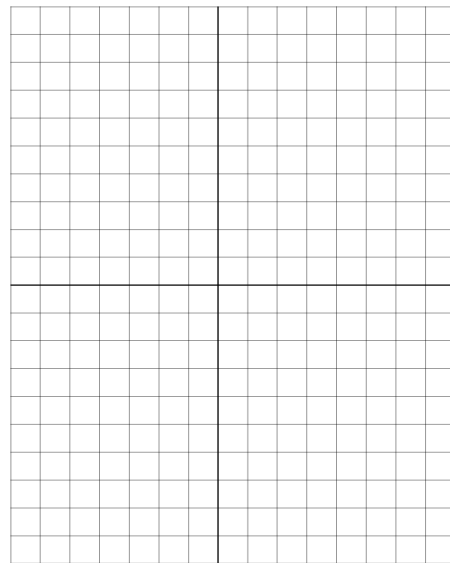
7. $y > x^2 + 6x + 7$



8. $y > x^2 - 8x + 17$



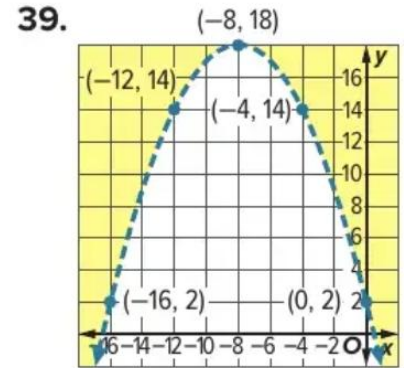
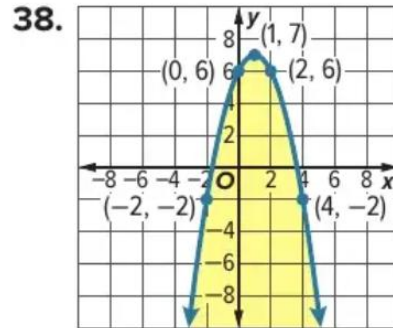
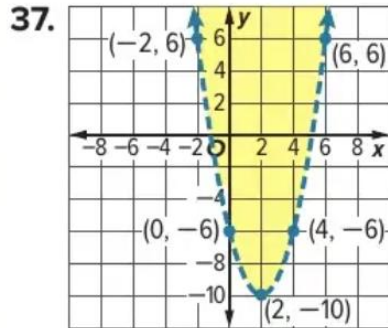
9. $y \geq x^2 + 2x + 2$



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Write a quadratic inequality for each graph.





8. Graph and analyze polynomial functions. Example 3 Page 75

Example 3 Degrees and Leading Coefficients

State the degree and leading coefficient of each polynomial in one variable. If it is not a polynomial in one variable, explain why.

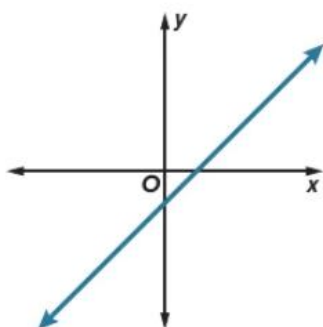
- a. $2x^4 - 3x^3 - 4x^2 - 5x + 6a$ degree: 4 leading coefficient: 2
- b. $7x^3 - 2$ degree: 3 leading coefficient: 7
- c. $4x^2 - 2xy + 8y^2$ This is not a polynomial in one variable. There are two variables, x and y .
- d. $x^5 + 12x^4 - 3x^3 + 2x^2 + 8x + 4$ degree: 5 leading coefficient: 1

9. Graph and analyze polynomial functions. Ex 15-20 Page 80

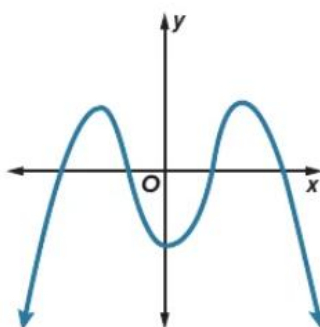
Example 5

Use the graph to state the number of real zeros of the function.

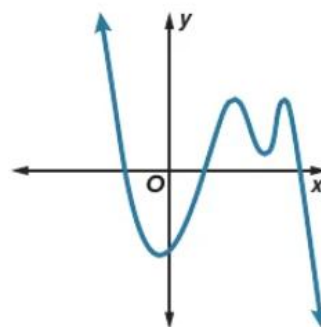
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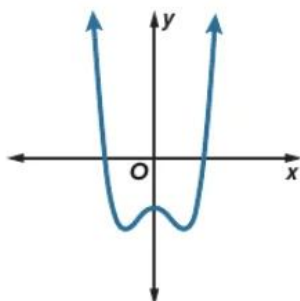
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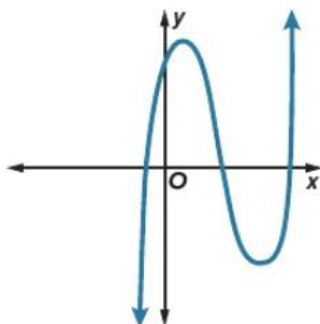
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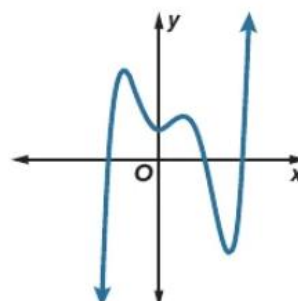
18.



19.



20.



10. Approximate zeros by graphing polynomial functions. Example 1 Page 83

Example 1 Locate Zeros of a Function

Determine the consecutive integer values of x between which each real zero of $f(x) = x^4 - 2x^3 - x^2 + 1$ is located. Then draw the graph.

Step 1 Make a table.

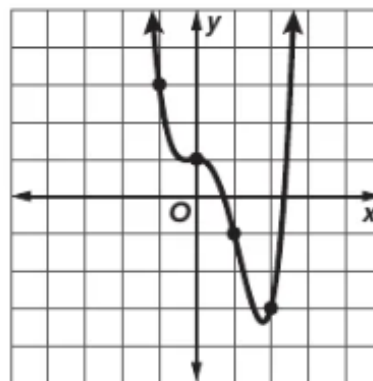
Because $f(x)$ is a fourth-degree polynomial, it will have as many as 4 real zeros or none at all.

x	-2	-1	0	1	2	3	4
$f(x)$	29	3	1	-1	-3	19	113

Using the Location Principle, there are zeros between $x = 0$ and $x = 1$ and between $x = 2$ and $x = 3$.

Step 2 Sketch the graph.

Use the table to sketch the graph and find the locations of the zeros.



Check

Use technology to check the location of the zeros.

Input the function into a graphing calculator to confirm that the function crosses the x -axis between $x = 0$ and $x = 1$ and between $x = 2$ and $x = 3$.

You can find more accurate values of the zeros by using the **zero** feature in the CALC menu to find $x \approx 0.7213$ and $x \approx 2.3486$, which confirms the estimates.

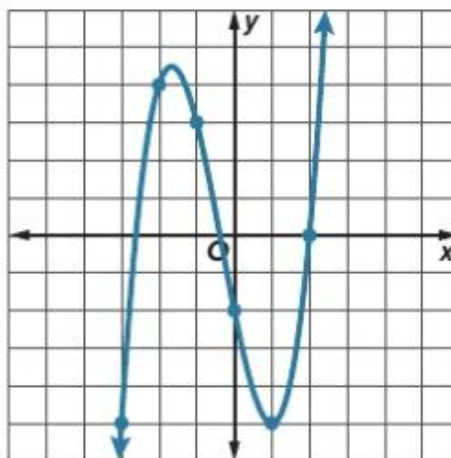
11. Find extrema of polynomial functions. Example 2 page 84

Example 2 Identify Extrema

Use a table to graph $f(x) = x^3 + x^2 - 5x - 2$. Estimate the x -coordinates at which the relative maxima and relative minima occur.

Step 1 Make a table of values and graph the function.

x	$f(x)$
-4	-30
-3	-5
-2	4
-1	3
0	-2
1	-5
2	0
3	19



Step 2 Estimate the locations of the extrema.

The value of $f(x)$ at $x = -2$ is greater than the surrounding points indicating a maximum *near* $x = -2$.

The value of $f(x)$ at $x = 1$ is less than the surrounding points indicating a minimum *near* $x = 1$.



12. Add and subtract polynomials. Examples 2 & 3 Page 94

Example 2 Add Polynomials

Find $(6x^3 + 7x^2 - 2x + 5) + (x^3 - 4x^2 - 8x + 1)$.

Method 1 Add horizontally.

Group and combine like terms.

$$\begin{aligned} & (6x^3 + 7x^2 - 2x + 5) + (x^3 - 4x^2 - 8x + 1) \\ &= (6x^3 + x^3) + (7x^2 - 4x^2) + (-2x - 8x) + (5 + 1) \quad \text{Group like terms.} \\ &= 7x^3 + 3x^2 - 10x + 6 \quad \text{Combine like terms.} \end{aligned}$$

Method 2 Add vertically.

Align like terms vertically and add.

$$\begin{array}{r} 6x^3 + 7x^2 - 2x + 5 \\ (+) x^3 - 4x^2 - 8x + 1 \\ \hline 7x^3 + 3x^2 - 10x + 6 \end{array} \quad \begin{array}{l} \text{Align like terms.} \\ \text{Combine like terms.} \end{array}$$

Example 3 Subtract Polynomials

Find $(2x^5 + 11x^4 + 7x - 8) - (5x^4 + 9x^3 - 3x + 4)$.

Method 1 Subtract horizontally.

Group and combine like terms.

$$\begin{aligned} & (2x^5 + 11x^4 + 7x - 8) - (5x^4 + 9x^3 - 3x + 4) \quad \text{Original equation} \\ &= 2x^5 + 11x^4 + 7x - 8 - 5x^4 - 9x^3 + 3x - 4 \quad \text{Distribute } -1. \\ &= 2x^5 + (11x^4 - 5x^4) + (-9x^3) + (7x + 3x) + (-8 - 4) \quad \text{Group like terms.} \\ &= 2x^5 + 6x^4 - 9x^3 + 10x - 12 \quad \text{Combine like terms.} \end{aligned}$$

Method 2 Subtract vertically.

Align like terms vertically and subtract.

$$\begin{array}{r} 2x^5 + 11x^4 + 0x^3 + 7x - 8 \\ (-) 0x^5 + 5x^4 + 9x^3 - 3x + 4 \\ \hline 2x^5 + 6x^4 - 9x^3 + 10x - 12 \end{array}$$



13. Multiply polynomials. Ex 16 – 26 Page 97

15. $-5(2c^2 - d^2)$

16. $x^2(2x + 9)$

17. $(a - 5)^2$

18. $(2x - 3)(3x - 5)$

19. $(x - y)(x^2 + 2xy + y^2)$

20. $(a + b)(a^3 - 3ab - b^2)$

21. $(x - y)(x + y)(2x + y)$

22. $(a + b)(2a + 3b)(2x - y)$

23. $(r - 2t)(r + 2t)$

24. $(3y + 4)(2y - 3)$

25. $(x^3 - 3x^2 + 1)(2x^2 - x + 2)$

26. $(4x^5 + x^3 - 7x^2 + 2)(3x - 1)$



14. Divide polynomials by using long division. Examples 1&2&3 Page 102

Example 1 Divide a Polynomial by a Monomial

Find $(24a^4b^3 + 18a^2b^2 - 30ab^3)(6ab)^{-1}$.

$$(24a^4b^3 + 18a^2b^2 - 30ab^3)(6ab)^{-1}$$

$$= \frac{24a^4b^3 + 18a^2b^2 - 30ab^3}{6ab}$$

Write a fraction.

$$= \frac{24a^4b^3}{6ab} + \frac{18a^2b^2}{6ab} - \frac{30ab^3}{6ab}$$

Sum of quotients

$$= \frac{24}{6}a^{4-1}b^{3-1} + \frac{18}{6}a^{2-1}b^{2-1} - \frac{30}{6}a^{1-1}b^{3-1}$$

Divide.

$$= 4a^3b^2 + 3ab - 5b^2$$

Simplify.

Example 2 Divide a Polynomial by a Binomial

Find $(x^2 - 5x - 36) \div (x + 4)$.

$$\begin{array}{r} x - 9 \\ x + 4 \overline{) x^2 - 5x - 36} \\ \underline{(-) x^2 + 4x} \\ -9x - 36 \\ \underline{(-) -9x - 36} \\ 0 \end{array}$$

The quotient is $x - 9$ and the remainder is 0.



Example 3 Find a Quotient with a Remainder

Find $\frac{3z^3 - 14z^2 - 7z + 3}{z - 5}$.

$$\begin{array}{r} 3z^2 + z - 2 \\ z - 5 \overline{) 3z^3 - 14z^2 - 7z + 3} \\ \underline{(-)3z^3 - 15z^2} \\ z^2 - 7z \\ \underline{(-)z^2 - 5z} \\ -2z + 3 \\ \underline{(-)-2z + 10} \\ -7 \end{array}$$

The quotient is $3z^2 + z - 2$ and the remainder is -7 .

Therefore, $\frac{3z^3 - 14z^2 - 7z + 3}{z - 5} = 3z^2 + z - 2 - \frac{7}{z - 5}$.



15. Solve polynomial equations by writing them in quadratic form and factoring

Example 6&7 Page 126 – Ex 16-27 Page 128

Example 6 Write Expressions in Quadratic Form

Write each expression in quadratic form, if possible.

a. $4x^{20} + 6x^{10} + 15$

Examine the terms with variables to choose the expression equal to u .

$$4x^{20} + 6x^{10} + 15 = (2x^{10})^2 + 3(2x^{10}) + 15 \quad (2x^{10})^2 = 4x^{20}$$

b. $18x^4 + 180x^8 - 28$

If the polynomial is not already in standard form, rewrite it. Then examine the terms with variables to choose the expression equal to u .

$$\begin{aligned} 18x^4 + 180x^8 - 28 &= 180x^8 + 18x^4 - 28 \\ &= 5(6x^4)^2 + 3(6x^4) - 28 \end{aligned} \quad \begin{array}{l} \text{Standard form} \\ \text{of a polynomial} \\ (6x^4)^2 = 36x^8 \end{array}$$

c. $9x^6 - 4x^2 - 12$

Because $x^6 \neq (x^2)^2$, the expression cannot be written in quadratic form.



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Example 7 Solve Equations in Quadratic Form

Solve $8x^4 + 10x^2 - 12 = 0$.

$$8x^4 + 10x^2 - 12 = 0$$

Original equation

$$2(2x^2)^2 + 5(2x^2) - 12 = 0$$

$$2(2x^2)^2 = 8x^4$$

$$2u^2 + 5u - 12 = 0$$

Let $u = 2x^2$.

$$(2u - 3)(u + 4) = 0$$

Factor.

$$u = \frac{3}{2} \text{ or } u = -4$$

Zero Product Property

$$2x^2 = \frac{3}{2} \quad 2x^2 = -4$$

Replace u with $2x^2$.

$$x^2 = \frac{3}{4} \quad x^2 = -2$$

Divide each side by 2.

$$x = \pm \frac{\sqrt{3}}{2} \quad x = \pm i\sqrt{2}$$

Take the square root of each side.

The solutions are $\frac{\sqrt{3}}{2}$, $-\frac{\sqrt{3}}{2}$, $i\sqrt{2}$, and $-i\sqrt{2}$.



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Write each expression in quadratic form, if possible.

16. $x^4 + 12x^2 - 8$

17. $-15x^4 + 18x^2 - 4$

18. $8x^6 + 6x^3 + 7$

19. $5x^6 - 2x^2 + 8$

20. $9x^8 - 21x^4 + 12$

21. $16x^{10} + 2x^5 + 6$



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Solve each equation.

22. $x^4 + 6x^2 + 5 = 0$

23. $x^4 - 3x^2 - 10 = 0$

24. $4x^4 - 14x^2 + 12 = 0$

25. $9x^4 - 27x^2 + 20 = 0$

26. $4x^4 - 5x^2 - 6 = 0$

27. $24x^4 + 14x^2 - 3 = 0$

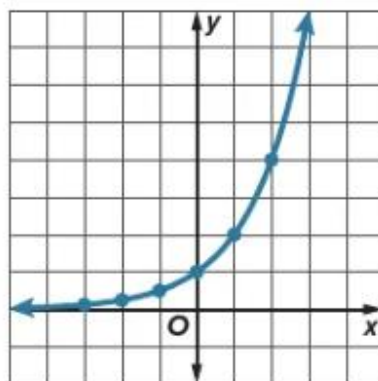
16. Graph exponential growth functions. Example 1 & 2 Page 217 - 218

Example 1 Graph Exponential Growth Functions

Graph $f(x) = 2^x$. Find the domain, range, y-intercept, asymptote, and end behavior.

Make a table of values. Then plot the points and sketch the graph.

x	$f(x) = 2^x$
-3	0.125
-2	0.25
-1	0.5
0	1
1	2
2	4
3	8



domain: all real numbers

range: all positive real numbers

y-intercept: (0, 1)

asymptote: $y = 0$

end behavior: As $x \rightarrow -\infty$, $f(x) \rightarrow 0$ and as $x \rightarrow \infty$, $f(x) \rightarrow \infty$.



Example 2 Graph Transformations of Exponential Growth Functions

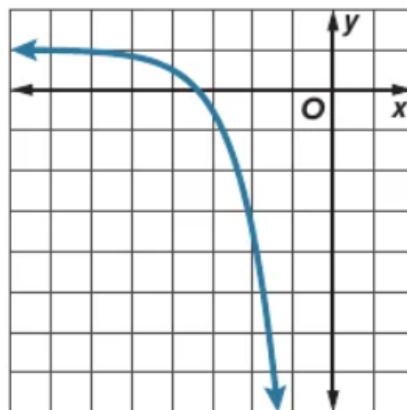
Graph $g(x) = -\frac{1}{2} \cdot 3^{x+4} + 1$.

Transform the graph of $g(x) = 3^x$.

$a = -\frac{1}{2}$; Reflect in the x -axis and compress vertically.

$h = -4$; Translate 4 units left.

$k = 1$; Translate 1 unit up.





17. Graph exponential decay functions. Example 6&7 Page 219 – 220

Example 6 Graph Exponential Decay Functions

Graph $f(x) = \left(\frac{1}{2}\right)^x$. Find the domain, range, y-intercept, asymptote, and end behavior.

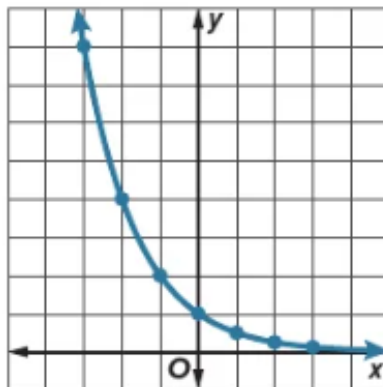
Make a table of values. Then plot the points and sketch the graph.

domain: all real numbers

range: all positive real numbers

y-intercept: (0, 1) asymptote: $y = 0$

end behavior: as $x \rightarrow -\infty$,
 $f(x) \rightarrow \infty$ and as $x \rightarrow \infty$, $f(x) \rightarrow 0$



Example 7 Graph Transformations of Exponential Decay Functions

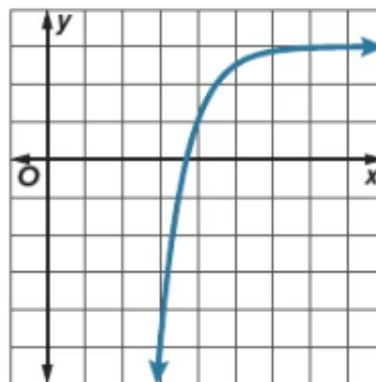
Graph $g(x) = -2\left(\frac{1}{4}\right)^{x-4} + 3$.

$g(x)$ is a transformation of $f(x) = \left(\frac{1}{4}\right)^x$.

$a = -2$; Reflect in the x -axis and stretch vertically.

$h = 4$; Translate 4 units right.

$k = 3$; Translate 3 units up.





18. Distinguish among sample surveys, experiments, and observational studies.

Example 4 Page 373 – Ex 11-14 Page 376

Example 4 Classify Study Types

UNIFORMS A research team wants to test new football uniform designs and their appeal to young adults. They randomly select 100 young adults to view the different uniforms. The research team observes and records the reactions to the uniforms.

Step 1 What is the purpose of the study?

The purpose is to determine if the new uniforms will be appealing to young adults.

Step 2 Does this situation represent a *survey*, an *experiment*, or an *observational study*?

This is a(n) observational study because the participants are observed without being affected by the study.

Step 3 Identify the sample and population.

The sample is the 100 young adults involved in the study. The population is all young adults.



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Determine whether each situation describes a *survey*, an *experiment*, or an *observational study*. Then identify the sample, and suggest a population from which it may have been selected.

- 11.** An Internet service provider conducts an online study in which customers are randomly selected and asked to provide feedback on their customer service.
- 12.** A research group randomly selects 100 business owners, half of whom started their own businesses, and compares their success.
- 13.** A research group randomly chooses 50 people to participate in a study to determine whether exercising regularly reduces the risk of diabetes in adults.
- 14.** An online video streaming service mails a questionnaire to randomly selected people across the country to determine whether they prefer streaming movies or sports.



19. Classify sampling methods and identify bias in samples and survey questions.

Example 3 Page 372 – Ex 7-10 Page 375

Example 3 Identify Biased Questions

FOOD A restaurant owner wants to determine which kinds of meals she should add to her menu: vegetarian options or more traditional meat-based dishes. She releases a survey to her customers asking the following question: *Do you prefer a plain salad or a delicious steak?* Identify any bias in the question.

Step 1 Identify the purpose of the question. The purpose is to determine which dishes are most popular with customers.

Step 2 Identify the bias in the sample. The question provides descriptions of each kind of food, and the description for the steak favors it over the salad.

Identify each sample or question as *biased* or *unbiased*. Explain your reasoning.

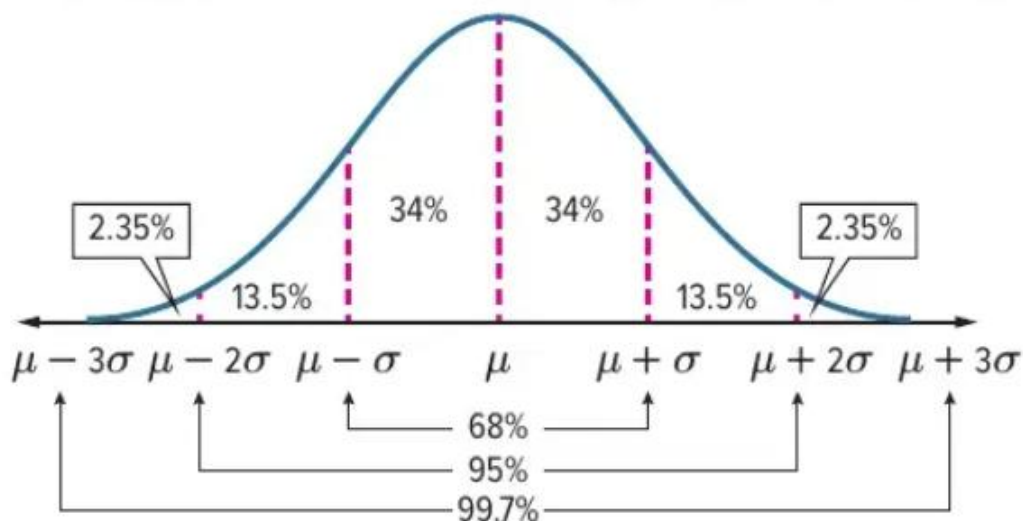
7. Do you think that the workout facility needs a new treadmill and racquetball court?
8. Which is your favorite type of music, pop, or country?
9. Are you a member of any after-school clubs?
10. Don't you agree that employees should pack their lunch?

20. Analyze normally distributed variables by using the Empirical Rule.

Concept Page 396

Key Concept • The Empirical Rule

In a normal distribution with mean μ and standard deviation σ ,



- approximately 68% of the data fall within 1σ of the mean,
- approximately 95% of the data fall within 2σ of the mean, and
- approximately 99.7% of the data fall within 3σ of the mean.



21. Solve quadratic equations by using the Quadratic Formula.

Ex 1-6 & 12 & 13 Page 47

Solve each equation by using the Quadratic Formula.

1. $x^2 + 8x + 15 = 0$

2. $x^2 - 18x + 72 = 0$

3. $12x^2 - 22x + 6 = 0$

4. $4x^2 - 6x = -2$

5. $x^2 + 8x + 5 = 0$

6. $-8x^2 + 4x = -5$

12. $x^2 + x - 8 = 0$

13. $8x^2 + 5x - 1 = 0$



22. Divide polynomials by using synthetic division. Examples 4&5 page 103 – 104

Example 4 Use Synthetic Division

Find $(3x^3 - 2x^2 - 53x - 60) \div (x + 3)$.

Step 1 Write the coefficients of the dividend and write the constant a in the box. Because $x + 3 = x - (-3)$, $a = -3$. Then bring the first coefficient down.

$$\begin{array}{r|rrrr} -3 & 3 & -2 & -53 & -60 \\ & \downarrow & & & \\ & 3 & & & \end{array}$$

Step 2 Multiply by a and write the product. The product of the coefficient and a is $3(-3) = -9$.

$$\begin{array}{r|rrrr} -3 & 3 & -2 & -53 & -60 \\ & & -9 & & \\ \hline & 3 & & & \end{array}$$

Step 3 Add the product and the coefficient.

$$\begin{array}{r|rrrr} -3 & 3 & -2 & -53 & -60 \\ & & -9 & & \\ \hline & 3 & -11 & & \end{array}$$

Step 4 Repeat Steps 2 and 3 until you reach a sum in the last column.

$$\begin{array}{r|rrrr} -3 & 3 & -2 & -53 & -60 \\ & & -9 & 33 & 60 \\ \hline & 3 & -11 & -20 & 0 \end{array}$$

Step 5 Write the quotient. Because the degree of the dividend is 3 and the degree of the divisor is 1, the degree of the quotient is 2. The final sum in the synthetic division is 0, so the remainder is 0.

The quotient is $3x^2 - 11x - 20$.



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Example 5 Divisor with a Coefficient Other Than 1

Find $\frac{4x^4 - 37x^2 + 4x + 9}{2x - 1}$.

To use synthetic division, the lead coefficient of the divisor must be 1.

$$\frac{(4x^4 - 37x^2 + 4x + 9) \div 2}{(2x - 1) \div 2}$$

Divide the numerator and denominator by 2.

$$= \frac{2x^4 - \frac{37}{2}x^2 + 2x + \frac{9}{2}}{x - \frac{1}{2}}$$

Simplify the numerator and denominator.

$$x - a = x - \frac{1}{2}, \text{ so } a = \frac{1}{2}.$$

Complete the synthetic division.

$\frac{1}{2}$	2	0	$-\frac{37}{2}$	2	$\frac{9}{2}$
		1	$\frac{1}{2}$	-9	$-\frac{7}{2}$
	2	1	-18	-7	1

The resulting expression is $2x^3 + x^2 - 18x - 7 + \frac{1}{x - \frac{1}{2}}$.

Now simplify the fraction.

$$\frac{1}{x - \frac{1}{2}} = \frac{(1)^2}{\left(x - \frac{1}{2}\right) \cdot 2}$$

Multiply the numerator and denominator by 2.

$$= \frac{2}{2x - 1}$$

Simplify.

The solution is $2x^3 + x^2 - 18x - 7 + \frac{2}{2x - 1}$.



23. Solve polynomial equations by factoring. Ex 1- 10 Page 127

Factor completely. If the polynomial is not factorable, write *prime*.

1. $8c^3 - 27d^3$

2. $64x^4 + xy^3$

3. $a^8 - a^2b^6$

4. $x^6y^3 + y^9$

5. $18x^6 + 5y^6$

6. $w^3 - 2y^3$



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7. $gx^2 - 3hx^2 - 6fy^2 - gy^2 + 6fx^2 + 3hy^2$ 8. $12ax^2 - 20cy^2 - 18bx^2 - 10ay^2 + 15by^2 + 24cx^2$

9. $a^3x^2 - 16a^3x + 64a^3 - b^3x^2 + 16b^3x - 64b^3$

10. $8x^5 - 25y^3 + 80x^4 - x^2y^3 + 200x^3 - 10xy^3$



24. Solve exponential equations in one variable. Ex 1 – 6 Page 229

Solve each equation.

1. $25^{2x+3} = 25^{5x-9}$

2. $9^{8x-4} = 81^{3x+6}$

3. $4^{x-5} = 16^{2x-31}$

4. $4^{3x-3} = 8^{4x-4}$



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5. $9^{-x+5} = 27^{6x-10}$

6. $125^{3x-4} = 25^{4x+2}$



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25. (a,b) Analyze standardized data and distributions by using z-values.

Examples 8 & 14 Page 400 , 402

Example 8 Find Area Under the Standard Normal Curve by Using a Calculator

INTERNET TRAFFIC The number of daily hits to a local news Web site is normally distributed with $\mu = 98,452$ hits and $\sigma = 10,325$ hits. Find the probability that the Web site will get at least 100,000 hits on a given day, $P(X > 100,000)$.

Visits Summary



Visits Summary - Last 30 Days

Visitor Demographics



Views by Category



Step 1 Find the corresponding z-value for $X = 100,000$.

$$z = \frac{X - \mu}{\sigma}$$

$$z = \frac{100,000 - 98,452}{10,325}$$

$$z \approx 0.150$$

Formula for z-value

$X = 100,000$, $\mu = 98,452$, and $\sigma = 10,325$

Simplify.

Step 2 Find the probability.

The area under the curve when $z > 4$ is negligible. So $z = 4$ can be used as an upper bound for finding area. You can use a graphing calculator to find the area between $z = 0.150$ and $z = 4$.

Press **2nd** **[DISTR]** and select **normalcdf**. Enter the interval and press **enter** to display the area.

The area is 0.44. Therefore, the probability of the Web site getting at least 100,000 hits in one day is 44.0%.

```
normalcdf(0.150,
4)
.4403506018
```



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- 14. TESTING** The scores on a test administered to prospective employees are normally distributed with a mean of 100 and a standard deviation of 12.3.
- What percent of the scores are between 70 and 80?
 - What percent of the scores are over 115?
 - If 75 people take the test, how many would you expect to score lower than 75?