1-1   1. Using the parent function at the right, perform the following transformation and graph the new function: horizontal compression by a factor of ½ followed by a reflection over the *x*-axis then vertical translation up 2 and a horizontal translation right 1.
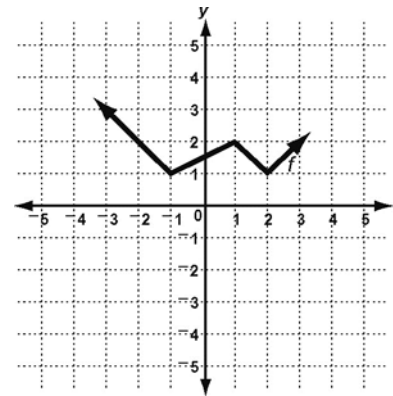
2-1   2. Write the equation for *g(x)*, in vertex form, that fits the description below.

a) "The parent function $f(x) = x^2$ is horizontally stretched by a factor of 9, reflected over the *x*-axis and translated up 8 units."

b) "The parent function $f(x) = x^2$ is vertically compressed by a factor of $\frac{3}{8}$, translated right 4 and down 7 units."

2-1   For question 3 and 4 below…
2-2   a) Describe the transformation from the parent quadratic function.
b) Determine the vertex.
c) Find an equation for the axis of symmetry.
d) Tell how the parabola opens.
e) Tell whether the graph has a max or a min and what that value is.
f) List the domain and range.
g) Then graph the parabola with at least 3 points labeled.

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

4. $g(x) = x^2 - 4x + 6$
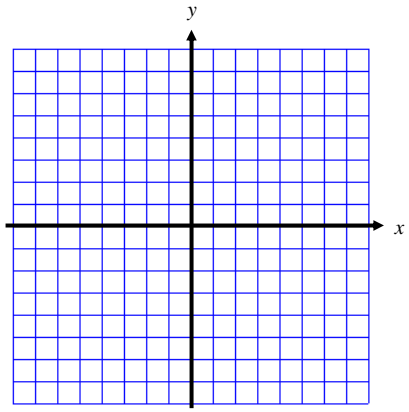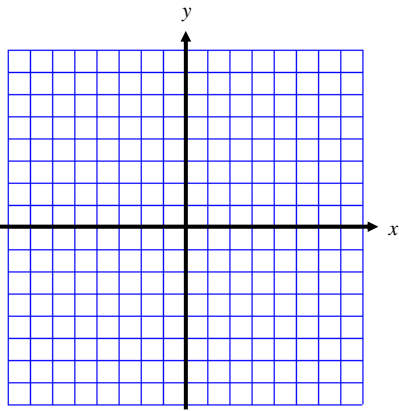
2-3   5. Given: $y = 10x^2 - 17x - 20$. Write the quadratic function as a product of factors.

2-3   6. Solve using factoring:

a) $x^2 - x - 30 = 0$

b) $10x^2 + 11x - 6 = 0$

2-3   7. Write a quadratic equation, in standard form, for the function whose zeros are $x = -\frac{1}{3}$ and

$x = 5$

2-4   8. Solve and simplify your answer:

a) $\frac{1}{3}(x+2)^2 = 4$

b) $2(5x+9)^2 = 8$

2-4   9. Rewrite in vertex form. Then, identify the vertex.

a) $y = x^2 + 4x + 1$

b) $y = 3x^2 - 6x + 1$.

2-5   10. Solve: $x^2 - 10x + 31 = -10$
2-6

2-6   11. Solve using the quadratic formula: $5x^2 + 10x - 11 = 0$
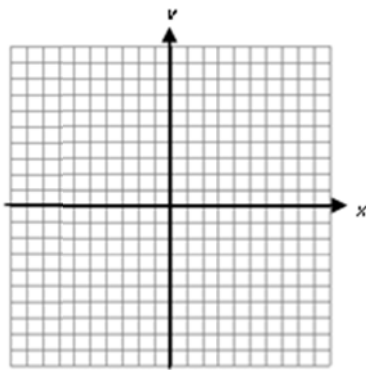Simplify your answer!

2-6   12. Given: $y = 9x^2 - 12x + 4$
   a) Find the value of the discriminant.

   b) Determine the number and type of solutions.

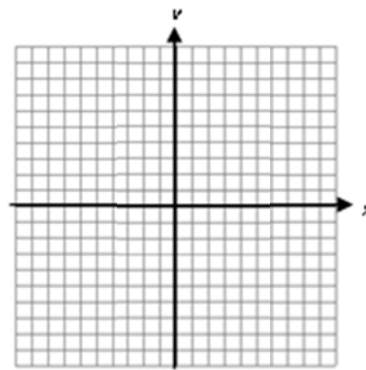**2-6**   13. Find the roots (real and imaginary) of each function.
   a) $f(x) = -x^2 + 8x - 3$ 　　　　　　　　b) $f(x) = 2x^2 - 9x + 25$

2-7   14. Graph each inequality.
   a) 　　　　　　　　$y \geq (x+3)^2 + 2$ 　　　　　　　　b) $y < x^2 - 6x - 16$

2-5   15. Find the complex conjugate: $4 + 3i$

2-9   16. Use complex conjugates to write the quotient in $a + bi$ form: $\dfrac{8+5i}{5+3i}$

3

2-9 17. Simplify: $(-4-4i)+(-9+8i)$

3-1 18. Add: $(3x^2+3x+5)+(-2x^2+4x+2)$

3-1 19. Subtract: $(7x^3-4x)-(-6x-5+5x^3)$

3-2 20. Multiply: $(x-1)(x^2-3x-5)$

3-3 21. Use synthetic substitution to evaluate the given polynomial for x = – 2

a) $6x^4-3x^3-12x^2-5x+6$ 　　　　b) $x^4-3x^3-11x^2-9$

3-3 Divide.

22. $\dfrac{-3x^4-7x^3+12x^2+7x+3}{x^2+3x-1}$ 　　　　23. $\dfrac{2y^2-2y+2}{y+2}$

3-4 24. Factor each expression completely.

a) $8x^6+27$ 　　　　b) $y^3+7y^2-2y-14$ 　　　　c) $2x^3-128$

d) $4x^3-8x^2-x+2$ 　　　　e) $6x^4-23x^2+20$ 　　　　f) $27x^2+39x-10$

3-4
3-5
3-6

25. Find all real and/or imaginary roots of each function.

a) $f(x) = (2x-3)(4-x)(x+7)$

b) $f(x) = 8x^3 - 4x^2 - 50x + 25$

c) $f(x) = 2x^3 + x^2 - 13x + 6$; given −3 is a zero

d) $f(x) = 5x^4 + 3x^3 + 3x^2 + 3x - 2$; given −1 and $\dfrac{2}{5}$ are zeros.

3-6 26. Write the simplest polynomial function in <u>factored</u> form with the given zeros.
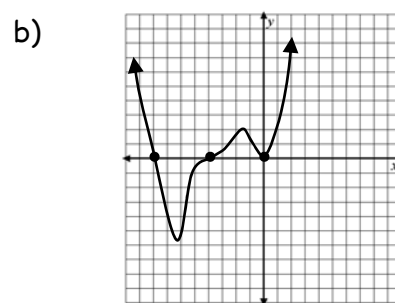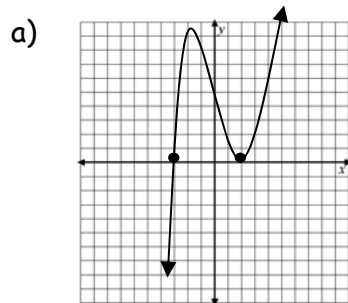
a) zeros of $-\frac{5}{4}$ and 2 (multiplicity of 2)

b) zeros of 6 and $\sqrt{3}$

d) zeros of 3 and 5 + i

3-7 27. For the graphs below, identify whether the function has an even or odd degree and positive or negative leading coefficient.

3-5 Also, identify the zeros and their multiplicity.

a)

b)

3-7 28. For each function,
   i) List the degree.
   ii) Describe the end behavior using infinity notation.
   iii) Find the zeros (including their multiplicity).
   iv) Based on the information from parts (a) through (c), sketch a graph of the function. Your sketch should have a scale on the x-axis only.
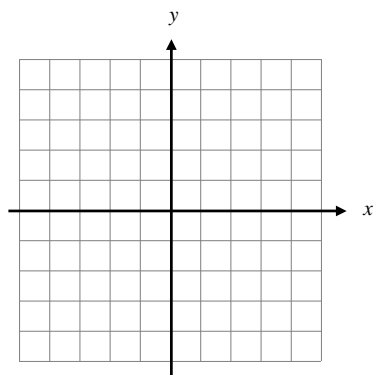
a) $f(x) = -2x^3(x-4)^2(2x+3)$

b) $g(x) = 3x^3 + 2x^2 - 27x - 18$

3-8 29. Consider the given parent function below. Rewrite the function given the following transformations and then sketch the transformed graph:
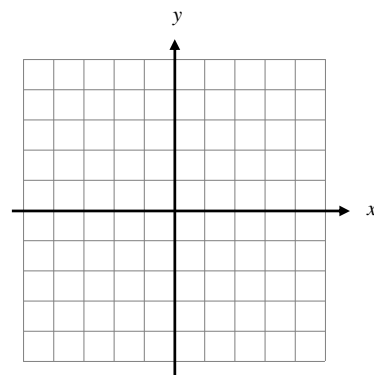
a) $f(x) = x^3$
Horizontal stretch by a factor of 2 and a vertical translation 1 units down.

b) $f(x) = x^4$
Vertical compression $\frac{1}{2}$ and reflect over the x axis.

Pre4 30. Simplify completely using the properties of exponents.

4-4 a) $\left(100^{\frac{5}{3}}\right)^{\frac{3}{2}}$

b). $7^{-\frac{9}{4}} \cdot 7^{\frac{1}{3}}$

c) $\dfrac{8^{\frac{5}{9}}}{8^{\frac{2}{9}}}$

d) $6^{\frac{1}{2}} \cdot 36^{\frac{5}{4}}$
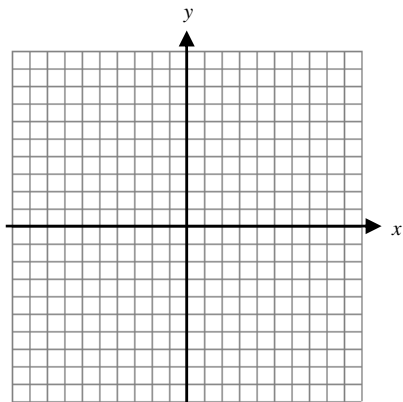
e) $\log_6\left(6^{7x-y}\right)$

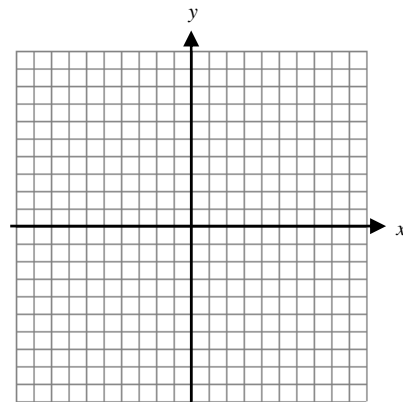f) $\dfrac{125^{\frac{7}{6}}}{5^{\frac{5}{2}}}$

g) $81^{-\frac{3}{4}}$

h) $\left(\dfrac{4}{9}\right)^{-\frac{3}{2}}$

4-1 31. Graph. Identify at least 2 points and the asymptote. Tell whether the graph shows exponential growth or exponential decay. Then identify the domain and range.

a) $y = 3^x$

b) $y = 2\left(\dfrac{1}{4}\right)^x$

4-2
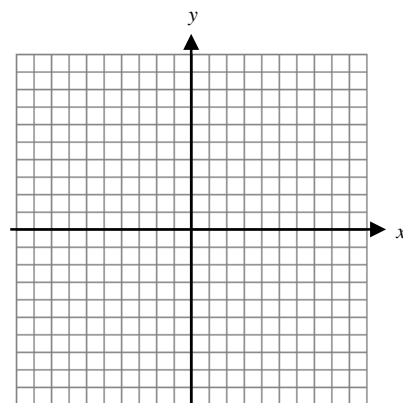**4-3** 32. Graph the function and its inverse in the same coordinate plane. Then, find an equation for $f^{-1}(x)$.

a) $f(x) = -2x + 5$
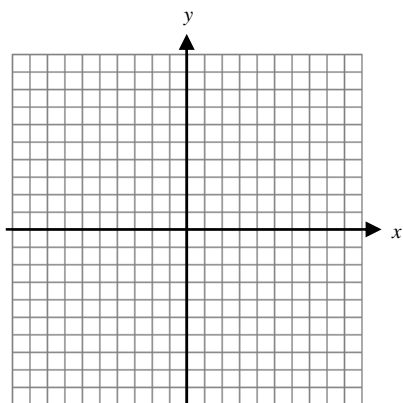
b) $f(x) = 3\left(\frac{1}{2}\right)^x$

4-3 33. Write the equation $3^4 = 81$ in logarithmic form.

4-3 34. Write the equation $\log_{125} 25 = \dfrac{2}{3}$ in exponential form.

4-3 35. Evaluate each logarithm.

a) $\log_{\frac{1}{25}} 125$

b) $\ln e^{-5+x}$

7

36. Identify the parent function and describe how it was transformed into the given function. Determine the asymptote. Graph the function by hand including 2 key points and a dashed line for the asymptote.

a) $g(x) = (2)^{-x} - 3$
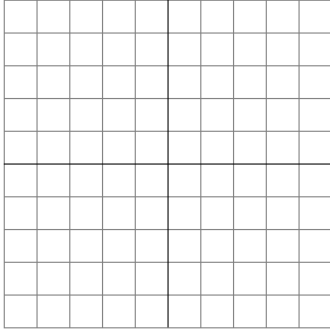
b) $h(x) = \frac{1}{2}\log_3(x+1)$
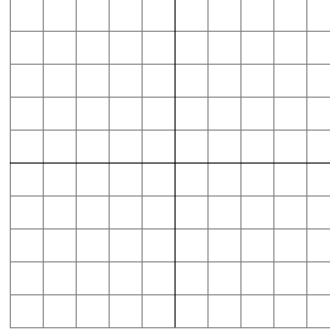
37. Rewrite the function given the transformation(s) below.

a) $g(x) = e^x$; horizontal stretch by a factor of 2 followed by a vertical translation 7 units down.

b) $h(x) = \ln x$; vertical stretch by a factor of 2 followed by a reflection over the y axis and a vertical translation 8 units up.

Round any decimal answers to the nearest thousandths.

1-4 38. A photographer hiked through the Grand Canyon. Each day she filled a photo memory card with images. When she returned from the trip, she deleted some photos, saving only the best. The table shows the number of photos she kept from all those taken on each memory card.

Grand Canyon Photos	
Photos Taken	Photos Kept
117	25
128	31
140	39
157	52
110	21
188	45
170	42

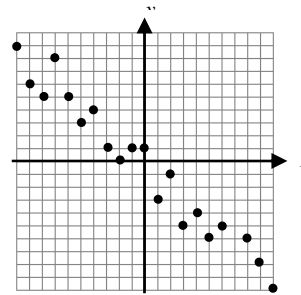a) Write the equation of the line of best fit.

b) Find the correlation coefficient.

c) Predict the number of photos the photographer will keep if she takes 200 photos on the memory card.

1-4 39. What type of relationship---positive, negative, or none---is shown by the scatter plot?

2-2 40. The equation $h = -16t^2 + 40t + 5$ gives the height h, in feet, of a baseball as a
2-3 function of time, t, in seconds, after it is hit.

a) What is the maximum height the baseball reaches? How many seconds does it take the ball to reach this height?

b) After how many seconds does the ball hit the ground if Mrs. Cofield and Mrs. Wilson are trying to catch it?

2-2   41. Give 3 ways to find the maximum value or minimum value for the function: $f(x) = -x^2 + 6x + 4$

2-7   42. Solve the inequality:

a) $3x^2 + 4x - 3 \leq 1$

b) $2x^2 + 3x + 6 > 5$

2-8   43. A variety of spruce trees called No. 1 Common Spruce are often used as support columns in buildings. The maximum load allowance for each column depends on the height of the spruce column. The following table gives some of this data.

Height of the Column (ft)	4	5	6	7
Maximum Load (lb)	7280	7100	6650	5960

a) Find a quadratic regression model for this data.

b) <u>Use the model</u> to predict the load allowed for a 6.5 ft spuce column.

c) What is the maximum load a Common Spruce can hold?

d) What is the height of the spruce column at that maximum load?

3.2   44. You are making an open box to hold paper clips out of a piece of cardboard that is 5 inches by 10 inches. The box will be formed by making an x inch by x inch square cut out of the corners as shown in the diagram and folding up the sides. You want the box to have the greatest volume possible.

a) Use a graphing calculator to find how long you should make the cuts. Explain your reasoning.

10 in.

5 in.
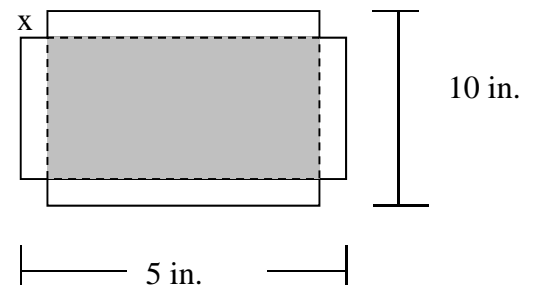
b) What is the maximum volume of the box?

c) What will the dimensions of the finished box be?

3-5   45. Find all real and/or imaginary zeros of each function. Show work!
3-6

a) $f(x) = 2x^3 - 13x^2 + 26x - 10$ b) $f(x) = 2x^4 - 7x^3 - 6x^2 + 44x - 40$

3-9   46. Use the table below to determine the best polynomial equation for the number of birds to visit a particular birdfeeder as a function of the number of months since 1-1-2011.
Give the best polynomial equation and explain why you chose that model.

Number of Months	1	2	3	4	5	6
Number of Birds	3	8	18	36	65	108

For questions 47-49: solve algebraically OR graphically. Be sure to practice BOTH methods.

4-1   47. A medication is eliminated from a person's bloodstream at a rate of 7 % per hour. Suppose a tablet contains 30 mg of medication. Write an equation for the amount of the medication in the bloodstream after x hours. How many hours will it take for <u>half</u> the tablet to be eliminated?

4-1   48. A computer programmer earned a yearly salary of $40,000 in 1990 and averaged a 4% raise each year after that time.

a) Find the doubling time for the programmer's salary.

b) Calculate the programmer's salary in 1998.

11

4-4   49. The Richter magnitude of an earthquake, M, is related to the energy released in ergs, E, by the formula $M = \dfrac{2}{3}\log\left(\dfrac{E}{10^{11.8}}\right)$.

a) In August 2011, an earthquake struck Colorado releasing approximately 5.623×10^{19} ergs of energy. What was the magnitude of this earthquake?

b) Find the inverse of the original equation.

c) How much energy was released by the 9.0 earthquake that struck off the coast of Japan in March of 2011?

4-4   50. Evaluate $\log_5 130$

4-5   51. Solve each equation algebraically.
4-6

a) $2(1.04)^{x+3} = 12$ b) $-16 = 4 - 5\left(\dfrac{1}{6}\right)^{3x}$

4-5   52. Use your graphing calculator to solve the inequality.

a) $2^{x-5} > 64$ b) $x - 8 < 4\log x$

4-6 53. If $3900 is deposited in an account at the bank and earns 6% annual interest, compounded continuously, what is the amount in the account after 4 years?

4-6 54. A paleontologist uncovers a fossil of a saber-toothed cat in California. He analyzes the fossil and concludes that the specimen contains 15% of its original carbon-14. Carbon-14 has a half-life of about 5730 years.

a) Using the equation $y = ae^{-kt}$, find the decay constant.

b) Using the equation, determine the age of the fossil. Show/Explain your work.

4-8 55. In one state, the Real Estate Board found that the median cost of housing changed according to the data in this table.

Years since 1990	Median cost (in dollars)
0	77,000
1	79,000
2	83,000
3	90,000
4	99,000

a) Find an exponential model for the data.

b) Determine the median cost of housing in the year 2005.
   DO NOT ROUND.

c) Predict the year when the median cost of housing will exceed $150,000

4.8 56. Determine whether f is an exponential function of x. If so, find the constant ratio.

a)

x	-1	0	1	2	3
y	9	27	41	113	329

b)

x	-2	-1	0	1	2
y	4	2	1	0.5	0.25