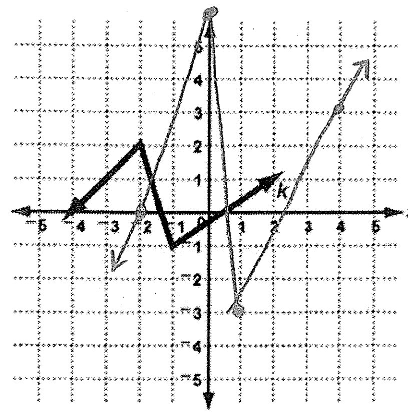
Algebra 2- Semester 1 Review

KEY

Non Calculator

1.1

1. Using the graph at the right as the parent function, perform the transformation and draw the transformed graph. Vertical stretch by a factor of 3, followed by a horizontal translation right 2.



x	y	New x	New y
-4	0	-2	0
-2	2	0	6
-1	-1	1	-3
2	1	4	3

$(x,y) \to (x+2, 3y)$

2.1, 3.8, 4.7

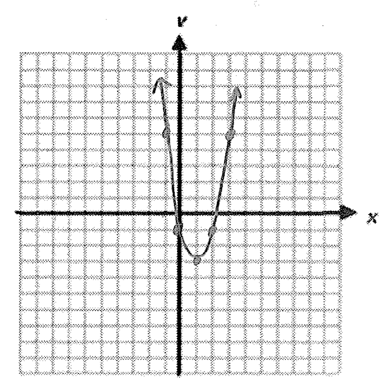
2. Given $h(x) = 2(x-1)^2 - 3$:

a) Describe the transformation from the parent function.

$y = x^2$ Vertical Stretch by a factor of 2 $(x,y) \to (x+1, 2y-3)$
Right 1
Down 3

b) Graph $h(x)$.

x	y	New x	New y
-2	4	-1	5
-1	1	0	-1
0	0	1	-3
1	1	2	-1
2	4	3	5



3. Consider $f(x) = \frac{1}{2}(2x)^3 - 4$:

a) Identify the parent function. $y = x^3$

b) Describe the transformation of the function from the parent function.

Vertical Compression by a factor of 1/2 Down 4 $(x,y) \to (\frac{1}{2}x, \frac{1}{2}y - 4)$
Horizontal Compression by a factor of 1/2

4. Write the equation for $g(x)$ if $f(x) = x^4$ is reflected over the x-axis, then translated left 2 and up 5.

$\boxed{g(x) = -(x+2)^4 + 5}$

XC
5. Consider $g(x) = 5^{3x} + 2$:

a) Identify the parent function. $\boxed{y = 5^x}$

b) Describe the transformation of the function from the parent function.

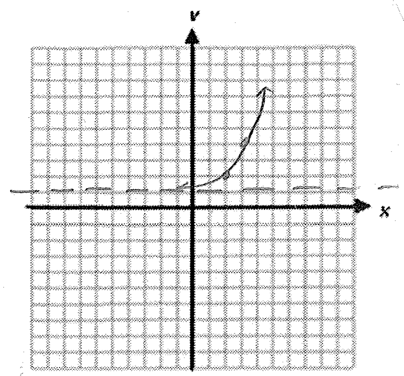
Horizontal Compression by a factor of 1/3 $(x,y) \to (\frac{1}{3}x, y+2)$
Up 2

6. Given $f(x)=3^{x-2}+1$:

a) Describe the transformation from the parent function. $y=3^x$

Right 2 Up 1 $(x+2, y+1)$

b) Graph $f(x)$.



H.A. $y=1$

Horizontal Asymptote: $y=1$

Points: $(0,1) \rightarrow (2,2)$

$(1,3) \rightarrow (3,4)$

7. Write the equation for $g(x)$ if $f(x)=\log x$ has a vertical stretch by a factor of 3, a horizontal stretch by a factor of 5, and is down 6.

$\boxed{g(x) = 3\log\left(\tfrac{1}{5}x\right) - 6}$

2.2

8. Given $f(x)=-x^2+2x+6$, find:

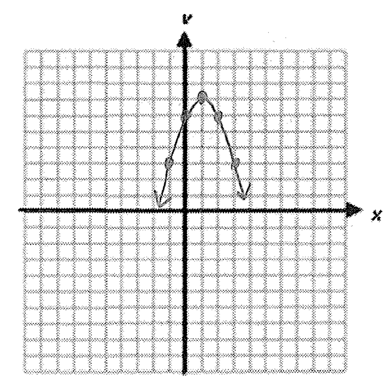
a) Axis of symmetry $x = \frac{-b}{2a} = \frac{-2}{2(-1)} = \frac{-2}{-2} = +1$

b) Vertex $(1,7)$ $f(1) = -(1)^2+2(1)+6 = -1+2+6 = 7$

c) y intercept $(0,6)$

d) Max/~~Min~~ Max $= 7$

e) Graph $f(x)$



f) Domain $\mathbb{R}$

g) Range $y \leq 7$

2.3

9. Solve $x^2-x-30=0$, by factoring.

$(x-6)(x+5)=0$

$\boxed{x=6 \text{ or } x=-5}$

10. Solve $5x^2-17x+6=0$, by factoring.

$(5x-2)(x-3)=0$

$\boxed{x=2/5 \text{ or } x=3}$

11. Write a quadratic equation, in standard form, for the function whose zeros are $x=-3$ and $x=4$.

$y=(x+3)(x-4)$

$y=x^2-4x+3x-12$

$\boxed{y=x^2-x-12}$

2.4

12. Solve $3x^2=75$ using square roots.

$\frac{3x^2}{3}=\frac{75}{3}$

$\sqrt{x^2}=\sqrt{25}$

$x=\pm 5$

13. Complete the square to put the function in vertex form, then identify the vertex.

$f(x) = x^2 + 10x - 1$ Vertex: $(-5, -26)$

$f(x) = x^2 + 10x + \underline{25} - 1 - \underline{25}$

$\left[\frac{1}{2}(10)\right]^2 = 25$

$f(x) = (x+5)^2 - 26$

2.5

14. Simplify: $\sqrt{-49}$ $= \boxed{7i}$

15. Solve: $x^2 + 9 = 0$ $\sqrt{x^2} = \sqrt{-9}$

$\boxed{x = \pm 3i}$

2.6

16. Find the zeros of each function using the quadratic formula.

a) $f(x) = -x^2 + 8x - 3$

$x = \dfrac{-8 \pm \sqrt{64 - 4(-1)(-3)}}{2(-1)}$

$x = \dfrac{-8 \pm \sqrt{64 - 12}}{-2} = \dfrac{-8 \pm \sqrt{52}}{-2} = \dfrac{-8 \pm 2\sqrt{13}}{-2}$

$\boxed{= 4 \mp \sqrt{13}}$

b) $f(x) = 2x^2 - 9x + 25$

$x = \dfrac{9 \pm \sqrt{81 - 4(2)(25)}}{2(2)} = \dfrac{9 \pm \sqrt{81 - 200}}{4}$

$= \dfrac{9 \pm \sqrt{-119}}{4}$

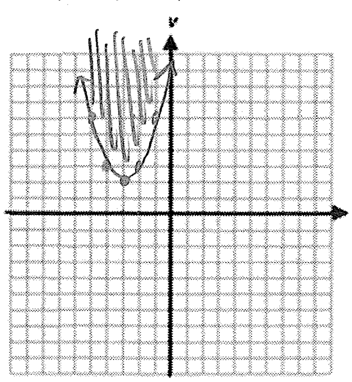
$= \boxed{\dfrac{9 \pm i\sqrt{119}}{4}}$

2.7

17. Graph each inequality.

a) $y \geq (x+3)^2 + 2$

vertex $(-3, 2)$



b) $y > -x^2 + 4x - 5$

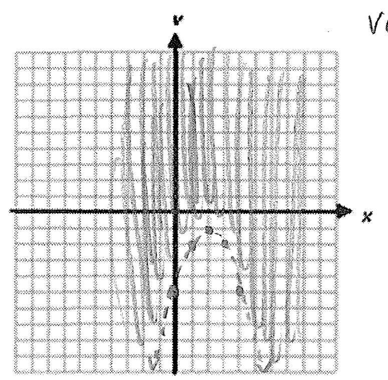
vertex: $x = -b/2a = \dfrac{-4}{2(-1)} = 2$

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

$= -4 + 8 - 5$

$= -1$

vertex $(2, -1)$



2.9

18. Simplify and write your result in $a + bi$ form.

a) $(3+7i) + (-2+3i)$ $= \boxed{1 + 10i}$

b) $(-9-4i) - (5+i)$ $= -9 - 4i - 5 - i$

$= \boxed{-14 - 5i}$

c) $(2-i)(4+3i)$ $= 8 + 6i - 4i - 3i^2$

$= 8 + 2i + 3$

$= \boxed{11 + 2i}$

d) $(4-2i)^2 = (4-2i)(4-2i)$

$= 16 - 8i - 8i + 4i^2$

$= 16 - 16i - 4$

$= \boxed{12 - 16i}$

3.1

$\angle C$ $\qquad$ d

Rewrite each polynomial in standard form. Then, a) identify the leading coefficient, b) the degree, c) the number of terms, d) describe the end behavior, and finally, e) name the polynomial.

19. $5x^2 + 6 + 9x - 10x^3$

Standard form: $-10x^3 + 5x^2 + 9x + 6$

LC $= -10$ $\quad$ 4 terms $\quad$ $\boxed{\text{CUBIC}}$

$d = 3$ $\quad$ as $x \to \infty$, $y \to -\infty$

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

20. $14x + 15x^4$

Standard form: $15x^4 + 14x$

LC $= 15$ $\quad$ 2 terms $\quad$ $\boxed{\text{QUARTIC}}$

$d = 4$ $\quad$ as $x \to \infty$, $y \to \infty$

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

Add or subtract each of the following. Write your answer in standard form.

21. $(34 + 8x^3 - 9x^2) - (3x^3 + 10x^2 - 4x - 4)$

$34 + 8x^3 - 9x^2 - 3x^3 - 10x^2 + 4x + 4$

$\boxed{5x^3 - 19x^2 + 4x + 38}$

22. $(12x^2 + 4x - 9) + (3x^3 - 7x^2 - 1)$

$\boxed{3x^3 + 5x^2 + 4x - 10}$

3.2

Find each product.

23. $3ab(2a^2 - 5ab + 9b)$

$\boxed{6a^3b - 15a^2b^2 + 27ab^2}$

24. $(x+3)(2x^2 - x + 6)$

$2x^3 - x^2 + 6x$

$+6x^2 - 3x + 18$

$\boxed{2x^3 + 5x^2 + 3x + 18}$

25. $(2x+6)^2$

$(2x+6)(2x+6)$

$4x^2 + 12x + 12x + 36$

$\boxed{4x^2 + 24x + 36}$

3.3

26. Divide using LONG division: $(2x^2 - 9x + 10) \div (2x - 1)$

$$\begin{array}{r} x - 4 \\ 2x - 1 \,\big)\, 2x^2 - 9x + 10 \\ -(2x^2 - x) \\ \hline -8x + 10 \\ -(-8x + 4) \\ \hline 6 \end{array}$$

$\dfrac{2x^2 - 9x + 10}{2x - 1} = x - 4 + \dfrac{6}{2x - 1}$

OR

$(2x-1)(x-4) + (6) = 2x^2 - 9x + 10$

27. Divide using SYNTHETIC division: $(3x^3 + 4x^2 - 8) \div (x - 2)$

2	3	4	0	−8
		6	20	40
	3	10	20	32

$\dfrac{3x^3 + 4x^2 - 8}{x - 2} = 3x^2 + 10x + 20 + \dfrac{32}{x - 2}$

OR

$(x-2)(3x^2 + 10x + 20) + 32 = 3x^3 + 4x^2 - 8$

3.4

28. Is (x + 2) a factor of $x^3 + 9x^2 + 9x - 10$?

−2	1	9	9	−10
		−2	−14	10
	1	7	−5	$\boxed{0}$

$\to$ YES, since the remainder $= 0$.

3.5

29. Solve by factoring and list the multiplicity of each root: $f(x) = x^3 + 3x^2 - 9x - 27$.

	x	3
x^2	x^3	$3x^2$
-9	$-9x$	-27

Root:

$x = -3$ multiplicity $= 2$

$x = 3$ multiplicity $= 1$

$f(x) = x^2(x+3) - 9(x+3)$

$f(x) = (x^2 - 9)(x+3)$

$f(x) = (x+3)(x-3)(x+3)$

3.6

30. Given the zeros write the simplest equation of the polynomial. Leave your answer in factored form. (-3, 3i, $\sqrt{2}$).

$\boxed{(x+3)(x-3i)(x+3i)(x-\sqrt{2})(x+\sqrt{2})}$

$-3i$ & $-\sqrt{2}$
are also zeros.

4.1

31. Identify whether each function shows growth or decay.

a) $f(x)=\frac{1}{3}(2)^x$ GROWTH

$2>1$

b) $f(x)=2(.19)^x$ DECAY

$.19<1$

32. The concentration of carbon monoxide fumes in the air at a local racetrack is growing at a rate of 3% per hour. If the initial concentration is 356 parts per in^3, write an exponential equation to represent this situation.

$y=356(1.03)^x$

x = # of hours
y = concentration of carbon monoxide

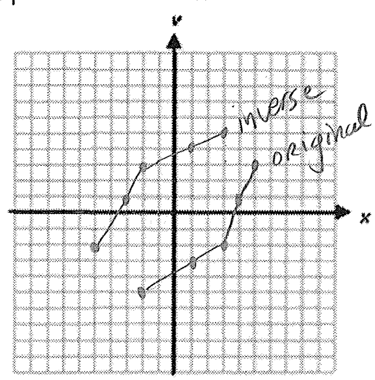
4.2

33. Graph the set of points below and connect the dots. Then graph the inverse.

x	-2	1	3	4	5
y	-5	-3	-2	1	3

inverse

x	-5	-3	-2	1	3
y	-2	1	3	4	5



34. If $g(x)=\frac{3}{5}x+5$, find $g^{-1}(x)$.

$y=\frac{3}{5}x+5$ original

$x=\frac{3}{5}y+5$ switch x & y

$x-5=\frac{3}{5}y$ Solve for y

$\frac{5}{3}(x-5)=y$

$f^{-1}(x)=\frac{5}{3}(x-5)=\frac{5}{3}x-\frac{25}{3}$

4.3

35. Rewrite in logarithmic form:

a) $5^2=25$ $\log_5(25)=2$

b) $64^{1/6}=2$ $\log_{64}(2)=1/6$

36. Rewrite in exponential form:

a) $\log_8 64=2$ $8^2=64$

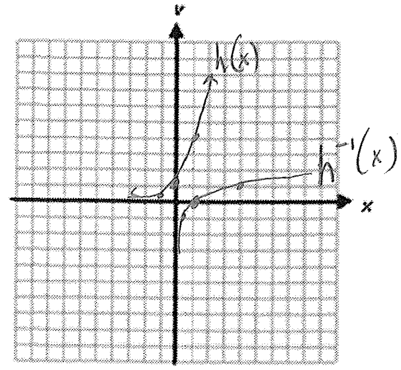
b) $\log_{27}3=\frac{1}{3}$ $27^{1/3}=3$

37. Using the function $h(x) = 4^x$:

x	h(x)
-1	1/4
0	1
1	4

x	$h^{-1}(x)$
1/4	-1
1	0
4	1

a) Graph $h(x)$ and $h^{-1}(x)$.



b) State the domain and range of each function.

$h(x)$:
D: $\mathbb{R}$
R: $y > 0$

$h^{-1}(x)$:
D: $x > 0$
R: $\mathbb{R}$

c) Find the equation of the inverse function. $y = 4^x$ original
$x = 4^y$ switch x & y → $\log_4(x) = y$

$\boxed{h^{-1}(x) = \log_4(x)}$

4.4

Express each as a single logarithm and simplify.

38. $\log_4 8 + \log_4 2$ $= \log_4(8 \cdot 2)$
$= \log_4(16)$
$= \boxed{2}$

39. $\log_2 10 + \log_2 12.8$
$= \log_2(10 \cdot 12.8) = \log_2(128)$
$= \boxed{7}$

40. $\log_6 144 - \log_6 4$
$\log_6\left(\frac{144}{4}\right) = \log_6(36)$
$= \boxed{2}$

41. Simplify.

a) $\log_7 49^5$ $= 5 \cdot \log_7(49)$
$= 5 \cdot 2$
$= \boxed{10}$

b) $\log_8 64^4$ $= 4 \cdot \log_8 64$
$= 4 \cdot 2$
$= \boxed{8}$

4.4, 4.6

Simplify the following expressions:

42. $10^{\log(3x-1)}$ $= \boxed{3x-1}$

43. $\log_8 8^{2x}$ $= \boxed{2x}$

44. $e^{\ln(5x+1)}$ $= \boxed{5x+1}$

45. $\ln e^{3x}$ $= \boxed{3x}$

4.5

Solve the following equations algebraically:

46. $25^x = 125^{x-2}$
$(5^2)^x = (5^3)^{x-2}$
$5^{2x} = 5^{3x-6}$
$2x = 3x - 6$
$-x = -6$
$\boxed{x = 6}$

47. $\log_4 x^5 = 20$ ⇒ $5 \cdot \log_4(x) = 20$
$\log_4(x) = 4$
$\boxed{4^4 = x}$
$\boxed{256 = x}$

48. $\log x^2 + \log 25 = 2$
$\log(25x^2) = 2$
$10^2 = 25x^2$
$100 = 25x^2$
$4 = x^2$
$\boxed{\pm 2 = x}$

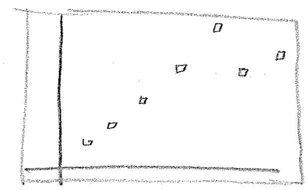
49. $\log 20x - \log 4 = 2$
$\log\left(\frac{20x}{4}\right) = 2$
$\log(5x) = 2$
$10^2 = 5x$
$100 = 5x$
$\boxed{20 = x}$

Calculator

1.4, 2.8, 3.9, 4.8

50. 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) Use a graphing calculator to make a scatterplot of the data.

b) Write the equation of the line of best fit. LINREG L₁,L₂,Y₁ $y = .33097043x - 11.32573346$

c) Find the correlation coefficient. $r \approx .8482291734$

d) Predict the number of photos the photographer will keep if she takes 200 photos on the memory card. $y(200) \approx 54.86835253$ $\boxed{\approx 55 \text{ photos}}$ $x = 200$

51. 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. QUADREG L₁, L₂, Y₁

$y \approx -127.5x^2 + 961.5x + 5475.5$

b) Use the model to predict the load allowed for a 6.5 ft spruce column.

$y(6.5) = \boxed{6338.375 \text{ lb}}$ $x = 6.5$

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

$\boxed{\text{y-value of vertex}}$ $\boxed{7288.210294}$ y-value of max

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

$\boxed{\text{x-value of vertex}}$

$x = -b/2a = \frac{-961.5}{2(-127.5)} \approx 3.770588235$ x-value of max

Can also graph in Y₁
Make window tall enough to see maximum
Calculate maximum

52. The data below shows the number of hummingbirds who visited Mr. Hunt's birdfeeder between 7:00 a.m. and 8:00 a.m. from January through June 2011.

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

a) Find a cubic regression model for this data.

$y = .5x^3 - .5x^2 + 3x$

b) Use the model to predict the number of hummingbirds in August. $x = 8$

$y = .5(8)^3 - .5(8)^2 + 3(8) = 248$

XC
53. A small group of farmers joined together to grow and sell wheat in $\boxed{1985.}$ The table shows how their production of wheat increased over 20 years. $X = 0$

Years after 1985	3	6	10	13	16	20
Wheat Produced (Tons)	70	105	150	210	340	580

a) Find an exponential model for the data. $y = 47.34058223(1.129952902)^x$

b) Use the model to predict what their wheat production will be in the year 2015. $x = 30$

$y = 47.34058223(1.129952902)^{30} \approx 1849.455326$ tons

c) Use the model to predict when their wheat production will exceed 700 tons.

$\underbrace{700}_{y_1} = \underbrace{47.34058223(1.129952902)^x}_{y_2}$ calc intersection ... $x \approx 22.047812$ years after 1985

54. The following table below shows the U.S. production of tobacco from 1997 to 2002.
XC

Years after 1996	1	2	3	4	5	6
Tobacco (x 100,000 lbs)	1787	1480	1293	1053	992	890

a) Find a logarithmic model for the data. $y = 1809.165021 - 510.6949132 \ln(x)$

b) Use the model to predict the tobacco production in the year 2005. $x = 9$

$y = 1809.165021 - 510.6949132 \ln(9) \approx \boxed{687.0536063}$

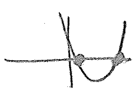
c) Use the model to predict when tobacco production could fall below 50,000,000 (500 x 100,000) lbs.

$\underbrace{500}_{y_1} = \underbrace{1809.165021 - 510.6949132 \ln(x)}_{y_2}$

calc intersection $x \approx 12.981137$

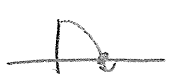
2.3

55. Solve $\underbrace{2x^2 - 8x + 5}_{y_1} = 0$, by graphing. Round answers to 3 decimal places.



calc zeros $x \approx .77525513$ or $x \approx 3.2247449$

56. A woman drops a front door key to her husband from their apartment window several stories above the ground. The function $h(x) = -16t^2 + 64$ gives the height, h, of the key in feet, t seconds after she releases it. How long does it take the key to hit the ground? $h = 0$



$-16t^2 + 64 = 0$
$-16t^2 = -64$
$t^2 = 4$
$t = \pm 2$
$\boxed{2 \text{ seconds}}$

2.8, 3.9

57. Use finite differences to determine the degree of the polynomial function that best models the data.

x	-2	-1	0	1	2	3
y	-2	-6	0	10	20	28

-4 6 10 10 8
10 4 0 -2
-6 -4 -2
2 2

$\boxed{4^{th} \text{ degree}}$ $\boxed{\text{Quartic}}$

x	-2	-1	0	1	2
y	-5	2	3	4	11

7 1 1 7
-6 0 6
6 6

$\boxed{3^{RD} \text{ degree}}$ $\boxed{\text{CUBIC}}$

x	3	4	5	6	7
y	-2	-5	-6	-5	-2

-3 -1 1 3
2 2 2

$\boxed{2^{nd} \text{ degree}}$ $\boxed{\text{Quadratic}}$

3.4

zeros ⇒ $x = 2, -2, \& -5$

58. Graph in your calculator to find the factors of $f(x) = x^3 + 5x^2 - 4x - 20$.

[Graph... find zeros write factors

Verify zeros work using synthetic Division

$$\begin{array}{r|rrrr} 2 & 1 & 5 & -4 & -20 \\ & & 2 & 14 & 20 \\ \hline -2 & 1 & 7 & 10 & 0 \\ & & -2 & -10 & \\ \hline & 1 & 5 & 0 & \end{array}$$

$(x+5)$

$\boxed{(x-2)(x+2)(x+5)}$

3.5

59. Solve for all real roots of the polynomial $f(x) = x^4 - 3x^3 - 5x^2 + 9x - 2$

$\boxed{\text{Roots} = -2, 1, 2+\sqrt{3}, 2-\sqrt{3}}$

graph...

$x=-2$ looks like a zero

$x=1$ looks like a zero

$$\begin{array}{r|rrrrr} -2 & 1 & -3 & -5 & 9 & -2 \\ & & -2 & 10 & -10 & 2 \\ \hline 1 & 1 & -5 & 5 & -1 & \boxed{0} \\ & & 1 & -4 & 1 & \\ \hline & 1 & -4 & 1 & \boxed{0} & \end{array}$$

$x^2 - 4x + 1 = 0$ Solve using quadratic formula

$x = \frac{4 \pm \sqrt{16 - 4(1)(1)}}{2(1)} = \frac{4 \pm \sqrt{12}}{2}$

$= \frac{4 \pm 2\sqrt{3}}{2} = \boxed{2 \pm \sqrt{3}}$

3.6

60. Solve for all roots of the polynomial $f(x) = x^3 + 13x - 116$.

graph... $x=4$ looks like a zero

$$\begin{array}{r|rrrr} 4 & 1 & 0 & 13 & -116 \\ & & 4 & 16 & 116 \\ \hline & 1 & 4 & 29 & \boxed{0} \end{array}$$

$x^2 + 4x + 29 = 0$ solve using quadratic formula

$x = \frac{-4 \pm \sqrt{16 - 4(1)(29)}}{2(1)}$

$x = \frac{-4 \pm \sqrt{16 - 116}}{2}$

$x = \frac{-4 \pm \sqrt{-100}}{2} = \frac{-4 \pm 10i}{2}$

$= \boxed{-2 \pm 5i}$

Roots: $x = 4$
$x = -2 + 5i$
$x = -2 - 5i$

4.1

61. Mr. Leckie bought his truck for $32,000. Its value decreases 8.5% each year.

$100 - 8.5 = 91.5\%$

$b = .915$!

a) Write an equation to represent the value of Mr. Leckie's truck as a function of time.

$y = 32000(.915)^x$

b) How much will his truck be worth after 3 years?

$y = 32000(.915)^3 \approx \boxed{\$24513.95}$

c) How many years will it take for the truck to fall below half of what he paid for it?

$\underbrace{16000}_{y_1} = \underbrace{32000(.915)^x}_{y_2}$ calculate intersection $x \approx 7.8029687$ years

4.3

62. The Richter magnitude of an earthquake, *M*, is related to the energy released in ergs, *E*, by the formula $M = \frac{2}{3}\log\left(\frac{E}{10^{11.8}}\right)$. Find the Magnitude of an earthquake that releases $10^{18.1}$ ergs.

$M = \frac{2}{3}\log\left(\frac{10^{18.1}}{10^{11.8}}\right) \approx \boxed{4.2}$

63. The time in years, *t*, that has passed since purchasing a used car is related to the price, *P*, that the car is currently worth by the formula $t = -10.25\log\left(\frac{P}{15000}\right)$. How many years have you owned the car if it is currently worth $9500?

$t = -10.25\log\left(\frac{9500}{15000}\right) \approx 2.033268451$ years

4.4

64. Evaluate the following expressions:

a) $\log_8 23 = \frac{\log(23)}{\log(8)} \approx 1.507853985$

b) $\log_{\frac{1}{2}} 23 = \frac{\log(23)}{\log(\frac{1}{2})} \approx -4.523561956$

4.5

Solve the following equations algebraically.

65. $9^x = 12$

$\log_9(12) = x$

$\frac{\log(12)}{\log(9)} \approx \boxed{1.130929754}$

66. $3.5^{2x-1} = 15$

$\log_{3.5}(15) = 2x-1$

$\frac{\log(15)}{\log(3.5)} = 2x-1$

$\frac{\log(15)}{\log(3.5)} + 1 = 2x$

$\frac{\frac{\log(15)}{\log(3.5)} + 1}{2} = x$

$\boxed{1.580831039 \approx x}$

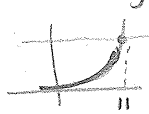
Use a table or a graph to solve the following equation or inequality.

67. $\underbrace{5^{2x}}_{y_1} = \underbrace{100}_{y_2}$

$\boxed{x \approx 1.430676558}$

Calculate intersection

68. $\underbrace{2^{x-5}}_{y_1} < \underbrace{64}_{y_2}$



$\boxed{x < 11}$

4.6

69. How much is an initial investment of $10,500 worth after 5 years when the interest of 7% is compounded continuously? "USE Pe^{rt}"

$10500e^{(.07)(5)} \approx \boxed{\$14900.21}$

70. If a given substance has an initial amount of 20 grams and a half-life of 1000 years, use the natural decay function, $N(t) = N_0e^{-kt}$ to:

when $t = 1000$ $N = \underbrace{10}_{\frac{1}{2} \text{ of } 20}$

a) Find the decay constant for this substance.

$10 = 20e^{-k \cdot 1000}$

$\frac{1}{2} = e^{-1000k}$

$\ln(\frac{1}{2}) = -1000k$

$\frac{\ln(\frac{1}{2})}{-1000} = k \longrightarrow k \approx .0006931471806$

b) Write an exponential decay function for this substance.

$\boxed{N = 20e^{-.0006931471806t}}$

c) Predict the amount of the substance after 750 years.

$N = 20e^{(-.0006931471806)(750)} \approx \boxed{11.892 \text{ grams}}$

4.8

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

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

$\frac{27}{9} = 3$ $\frac{41}{27} = 1.52$

Not exponential

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

$\frac{2}{4} \to .5$ $\frac{1}{2} \to .5$ $\frac{.5}{1} \to .5$ $\frac{.25}{.5} \to .5$

Yes...

$\boxed{.5 = \text{Constant Ratio}}$