Lesson 12.1.1 (day 1) p. 622-623 : 5-10

5. a. $3x-2-4(x+1)=-x-6$

$3x-2-4x-4=-x-6$

$-x-6=-x-6$

T

$\boxed{\text{Always True}}$

b. $3x-5=2(x+1)+x$

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

$\cancel{3x}-5=\cancel{3x}+2$

$-5=2$

F

$\boxed{\text{Never True}}$

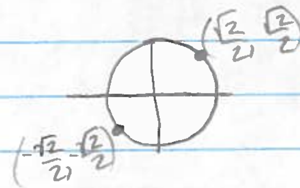
c. $\sin(x)=\cos\left(\frac{\pi}{2}-x\right)$

Graphs are the same

$\boxed{\text{Always True}}$

d. $\tan(x)=1$

$\tan=\frac{\sin}{\cos}$



$\frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}}$ or $\frac{-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}}=1$

$x=\frac{\pi}{4},\ \frac{5\pi}{4}$

$\boxed{\text{Sometimes True when } x=\frac{\pi}{4}+2\pi n,\ x=\frac{5\pi}{4}+2\pi n}$

6. a. x^2-4

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

b. y^2-81

$\boxed{(y+9)(y-9)}$

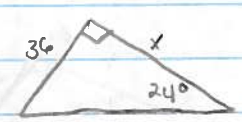
c. $1-x^2$

$\boxed{(1+x)(1-x)}$

d. $1-\sin^2(x)$

$\boxed{(1+\sin x)(1-\sin x)}$

7. a.

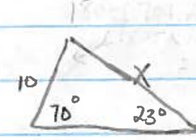


$\tan 24° = \frac{36}{x}$

$x=\frac{36}{\tan 24°}$

$\boxed{x=80.86}$

b.



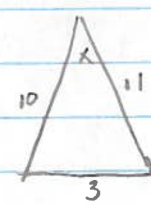
$\frac{\sin 23}{10}=\frac{\sin 70}{x}$

$x=\frac{10\sin 70}{\sin 23}$

$\boxed{x=24.05}$

law of sines

c.



law of cosines

$3^2=\underbrace{10^2+11^2}-\underbrace{2(10)(11)}\cos x$

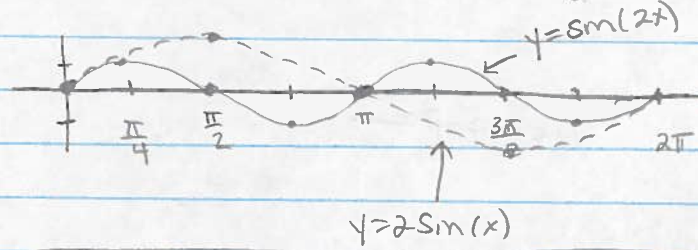
$9=221-220\cos x$

$-212=-220\cos x$

$\cos x=.9636$

$\boxed{x=15.5°}$

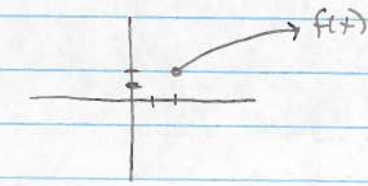
8. Show $\sin(2x) = 2\sin(x)$ for integer multiples of π



$\boxed{\text{Graphs intersect only when } x = \pi, 2\pi, 3\pi, 4\pi \ldots}$

9. $f(x) = 2 + \sqrt{2x - 4}$

$2x - 4 = 0$
$2x = 4$
$x = 2$



a. $\boxed{\begin{array}{l} D: x \geq 2 \\ R: y \geq 2 \end{array}}$

b. x
$*2$
-4
$\sqrt{\ }$
$+2$

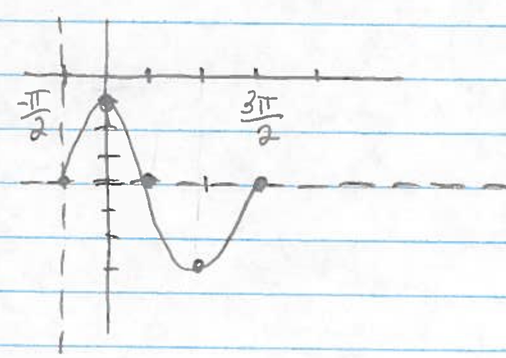
$\boxed{f^{-1}(x) = \frac{(x-2)^2 + 4}{2}}$

c. $\boxed{\begin{array}{l} x \geq 2 \\ y \geq 2 \end{array}}$

10. $f(x) = 3\sin\left(x + \frac{\pi}{2}\right) - 4$

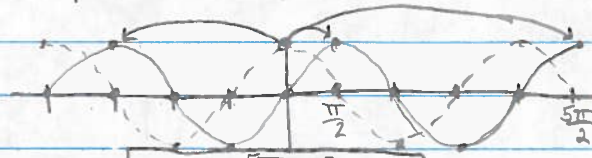
a. Shift left $\frac{\pi}{2}$
Shift down 4
Vertical stretch = 3

b.



Lesson 12.1.1 (day 2) p.624: 14-20

14. $\cos(x-h) = \sin(x)$
dotted Solid



Graphs will be the same when $\boxed{h = \frac{\pi}{2}, \frac{5\pi}{2}, -\frac{3\pi}{2} \ldots}$

15. $\pi \le \theta \le \frac{3\pi}{2}$ means Quadrant 3 !

a. $\sin(\theta)$ is $\boxed{\text{neg}}$

b. $\cos(\theta)$ is $\boxed{\text{neg}}$

c. $\tan(\theta) = \boxed{\text{pos}}$

d. $\frac{1}{\cos(\theta)} = \boxed{\text{neg}}$

16. $ax^2 + 5x + 6 = 0$ (use the discriminant)

$b^2 - 4ac \ge 0 \Rightarrow (5)^2 - 4(a)(6) \ge 0$

$25 - 24a = 0$

$25 = 24a$

$a = \frac{25}{24}$

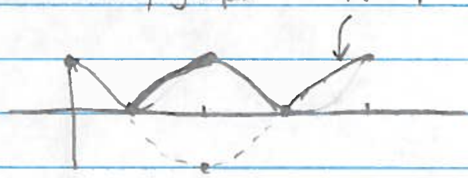
$\boxed{a \le \frac{25}{24}}$

check $a = 0$

$25 - 0 \ge 0$

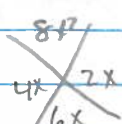
T

17. if $f(x) = \cos(x)$, graph $f(x) = |\cos(x)|$



18. $\frac{5x+10}{x^2+6x+8} = \frac{5\cancel{(x+2)}}{(x+4)\cancel{(x+2)}} = \boxed{\frac{5}{x+4}}$

4	4x	8
x	x^2	2x
	x	2



19. a. $\sqrt{x+7} + 5 = x$

$(\sqrt{x+7})^2 = (x-5)^2$

$x+7 = x^2 - 10x + 25$

$0 = x^2 - 11x + 18$

-5	$-5x$	25
x	x^2	$-5x$
	x	-5

-2	$-2x$	18
x	x^2	$-9x$
	x	-9

$18x^2$, $-9x$, $-2x$, $-11x$

$0 = (x-2)(x-9)$

$\cancel{2}, \boxed{9}$

extraneous

b. $\dfrac{a}{a^2-36} + \dfrac{2}{a-6} = \dfrac{1}{a+6}$

$\dfrac{a}{(a+6)(a-6)} + \dfrac{2}{a-6}\dfrac{(a+6)}{(a+6)} = \dfrac{1}{a+6}\dfrac{(a-6)}{(a-6)}$

$\dfrac{a}{(a+6)(a-6)} + \dfrac{2a+12}{(a+6)(a-6)} = \dfrac{a-6}{(a+6)(a-6)}$

$3a+12 = a-6$

$2a = -18$

$\boxed{a = -9}$

20. a. $108^\circ \cdot \dfrac{\pi}{180}$ $\boxed{\dfrac{3\pi}{5}}$

b. $320^\circ \cdot \dfrac{\pi}{180}$ $\boxed{\dfrac{16\pi}{9}}$

c. $\dfrac{7\pi}{9} \cdot \dfrac{180}{\pi}$ $\boxed{140^\circ}$

d. $\dfrac{19\pi}{12} \cdot \dfrac{180}{\pi}$ $\boxed{285^\circ}$

e. $\dfrac{17\pi}{2} \cdot \dfrac{180}{\pi}$ $\boxed{1530^\circ}$

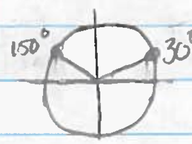
f. $260^\circ \cdot \dfrac{\pi}{180}$ $\boxed{\dfrac{13\pi}{9}}$

Lesson 12.1.2 p.626-628: 29-33

29. a. $2\sin(x) - 1 = 0$

$2\sin(x) = 1$

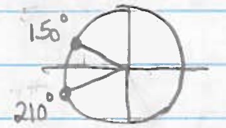
$\sin(x) = \frac{1}{2}$



$\boxed{x = \frac{\pi}{6} \quad x = \frac{5\pi}{6}}$

b. $2\cos(x) = -\sqrt{3}$

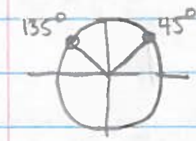
$\cos(x) = \frac{-\sqrt{3}}{2}$



$\boxed{x = \frac{5\pi}{6} \quad x = \frac{7\pi}{6}}$

c. $2\sin(x) = \sqrt{2}$

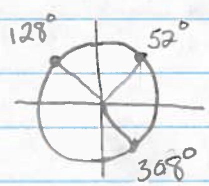
$\sin(x) = \frac{\sqrt{2}}{2}$



$\boxed{x = \frac{\pi}{4} \quad x = \frac{3\pi}{4}}$

d. $\cos(x) = 1$

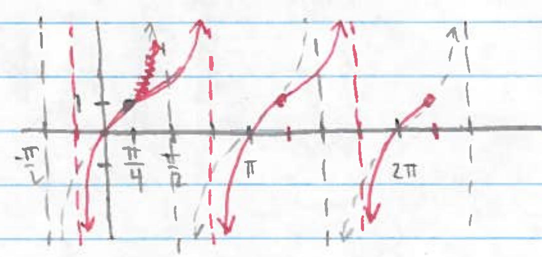
$\boxed{x = 0 \quad x = 2\pi}$

30. 

NO, there are only 2 angles between $0 \le x \le 2\pi$ that will have the same cosine. $52°$ and $308°$ have the cosine values.

31. $f(x) = 1 + \tan(x - \frac{\pi}{4})$

hard → right $\frac{\pi}{4}$, up 1



Red graph is the shifted graph

32. $f(x) = -x + 6$

x
$\times -1$
$+6$

$f^{-1}(x) = \frac{x-6}{-1}$

$\boxed{f^{-1}(x) = -x + 6}$

The inverse is itself!

33. $\frac{x-2}{x+2} + \frac{2x-6}{x^2-x-6} = \frac{(x-3)\cdot(x-2)}{(x-3)\cdot(x+2)} + \frac{2(x-3)}{(x-3)(x+2)}$

$$\begin{array}{c|c|c} -3 & -3x & -6 \\ \hline x & x^2 & 2x \\ \hline & x & 2 \end{array}$$

$-6x^2$, $-3x$, $2x$, $-1x$

$$= \frac{x^2-5x+6}{(x-3)(x+2)} + \frac{2x-6}{(x-3)(x+2)} = \frac{x^2-3x}{(x-3)(x+2)}$$

$$\begin{array}{c|c|c} -3 & -3x & 6 \\ \hline x & x^2 & -2x \\ \hline & x & -2 \end{array}$$

$$= \frac{x(\cancel{x-3})}{(\cancel{x-3})(x+2)}$$

$$= \boxed{\frac{x}{x+2}}$$

134 a. $1(x-1) = x-1$ ✓

$(x-1)(x+1) = x^2-1$ ✓

$(x-1)(x^2+x+1) =$
$$\begin{array}{c|c|c|c} -1 & \cancel{-x^2} & \cancel{-x} & -1 \\ \hline x & x^3 & \cancel{x^2} & \cancel{x} \\ \hline & x^2 & x & 1 \end{array} = x^3-1$$ ✓

$(x-1)(x^3+x^2+x+1) =$
$$\begin{array}{c|c|c|c|c} -1 & \cancel{-x^3} & \cancel{-x^2} & \cancel{-x} & -1 \\ \hline x & x^4 & \cancel{x^3} & \cancel{x^2} & \cancel{x} \\ \hline & x^3 & x^2 & x & 1 \end{array} = x^4-1$$ ✓

b. $\frac{x^5-1}{x-1} = \boxed{x^4+x^3+x^2+x+1}$

c. $\frac{x^n-1}{x-1}$

Lesson 12.1.3 (day 1) p. 630-631: 42-45 (omit 43d)

42. a. $2\cos(x) - 1 = 0$

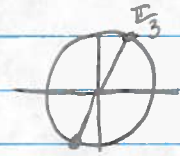
$2\cos(x) = 1$

$\cos(x) = \frac{1}{2}$

$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{5\pi}{3} + 2\pi n}$

b. $\tan(x) = \sqrt{3}$

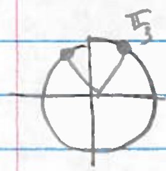
$\dfrac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\sqrt{3}}{2} \cdot \frac{2}{1}$



$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{4\pi}{3} + 2\pi n}$

c. $2\sin(x) = \sqrt{3}$

$\sin(x) = \frac{\sqrt{3}}{2}$



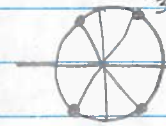
$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{2\pi}{3} + 2\pi n}$

d. $4\sin^2(x) - 3 = 0$

$4\sin^2(x) = 3$

$\sqrt{\sin^2(x)} = \sqrt{\frac{3}{4}}$

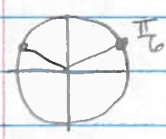
$\sin(x) = \pm\frac{\sqrt{3}}{2}$



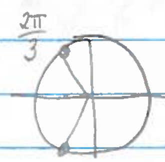
$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{2\pi}{3} + 2\pi n \quad x = \frac{4\pi}{3} + 2\pi n \quad x = \frac{5\pi}{3} + 2\pi n}$

43. a. $\sin(\theta) = .5$

$\boxed{x = \frac{\pi}{6} \quad x = \frac{5\pi}{6}}$



b. $\cos(\theta) = -.5$

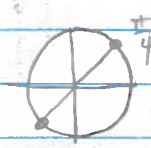


$\boxed{x = \frac{2\pi}{3} \quad x = \frac{4\pi}{3}}$

c. $4\tan(\theta) - 4 = 0$

$4\tan(\theta) = 4$

$\tan(\theta) = 1$



$\boxed{x = \frac{\pi}{4} \quad x = \frac{5\pi}{4}}$

44. a. D: $-3 \le x \le 3$
R: $-3 \le y \le 3$
Not a function

b. D: $-3 \le x \le 4$
R: $-2 \le y \le 4$
Not a function

c. D: $x \le 3$
R: $y \le 4$
Function

d. D: $\mathbb{R}$
R: $y \ge -2$
function

45. a. $(\sqrt{x+7})^2 = (x+1)^2$

$x+7 = x^2+2x+1$

$0 = x^2+x-6$

1	x	1
x	x^2	x
	x	1

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

$-6x^2$

$3x \quad -2x$

$1x$

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

$\cancel{-3} \quad \boxed{2}$

Check $x=-3$

$\sqrt{4} = -2$ NO

Check $x=2$

$\sqrt{9} = 3$ ✓

b. $\frac{2}{x+3} - \frac{1}{x} = \frac{-6}{x^2+3x}$

$x\cancel{(x+3)}\left(\frac{2}{\cancel{x+3}}\right) - \left(\frac{1}{\cancel{x}}\right)\cancel{x}(x+3) = \left(\frac{-6}{\cancel{x(x+3)}}\right)\cancel{x(x+3)}$

$2x - x - 3 = -6$

$x - 3 = -6$

$x = \cancel{-3}$

Can't use this answer b/c it gives ÷ by 0 in the original problem

$\boxed{\text{NO Solution}}$

Lesson 12.1.3 (day 2) p. 632-633: 52-58

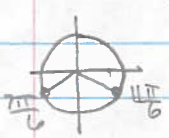
52. Restricted domains are needed to make the inverses functions.

- Restricted domain for sine is $\frac{-\pi}{2} \le x \le \frac{\pi}{2}$
- Restricted domain for cosine is $0 \le x \le \pi$
- Restricted domain for tangent is $\frac{-\pi}{2} < x < \frac{\pi}{2}$

53. a. $4\sin(x) + 2 = 0$

$4\sin(x) = -2$

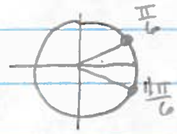
$\sin(x) = \frac{-1}{2}$



$\boxed{\begin{array}{l} x = \frac{7\pi}{6} + 2\pi n \\ x = \frac{11\pi}{6} + 2\pi n \end{array}}$

b. $2\cos(x) = \sqrt{3}$

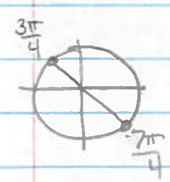
$\cos(x) = \frac{\sqrt{3}}{2}$



$\boxed{\begin{array}{l} x = \frac{\pi}{6} + 2\pi n \\ x = \frac{11\pi}{6} + 2\pi n \end{array}}$

c. $\tan(x) + 1 = 0$

$\tan(x) = -1$



$\boxed{\begin{array}{l} x = \frac{3\pi}{4} + 2\pi n \\ x = \frac{7\pi}{4} + 2\pi n \end{array}}$

or

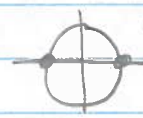
$\boxed{x = \frac{3\pi}{4} + \pi n}$

d. $4\cos^2(x) - 4 = 0$

$4\cos^2(x) = 4$

$\sqrt{\cos^2(x)} = \sqrt{1}$

$\cos(x) = \pm 1$



$\boxed{\begin{array}{l} x = 0 + 2\pi n \\ x = \pi + 2\pi n \end{array}}$

or

$\boxed{x = \pi + \pi n}$

54. a. up 1

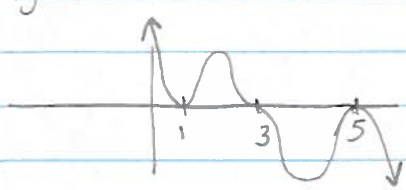
b. left $\frac{\pi}{4}$

c. Reflect over x-axis

d. Vertical stretch by 4

55a. $f(x) = (x-1)^2(x-3)^3(x-5)^2$

55 b. $g(x) = -(x-1)^2(x-3)^3(x-5)^2$



55c. g(x) is the reflection of f(x) over the x-axis

so, $\boxed{g(x) = -f(x)}$

56. a. $\frac{1}{2}+\frac{1}{3}=\quad\frac{3}{6}+\frac{2}{6}=\boxed{\frac{5}{6}}$

b. $\frac{x}{x}\cdot\frac{3}{2x}+\frac{4}{x^2}\cdot\frac{2}{2}=\frac{3x}{2x^2}+\frac{8}{2x^2}=\boxed{\frac{3x+8}{2x^2}}$

c. $\frac{x-1}{x-1}\cdot\frac{x}{x+1}+\frac{3}{x-1}\cdot\frac{x+1}{x+1}=\frac{x^2-x}{(x-1)(x+1)}+\frac{3x+3}{(x-1)(x+1)}=\boxed{\frac{x^2+2x+3}{(x-1)(x+1)}}$

d. $\frac{\sin\theta}{\sin\theta}\cdot\frac{\sin\theta}{\cos\theta}+\frac{1}{\sin\theta}\cdot\frac{\cos\theta}{\cos\theta}=\boxed{\frac{\sin^2\theta+\cos\theta}{\sin\theta\cos\theta}}$

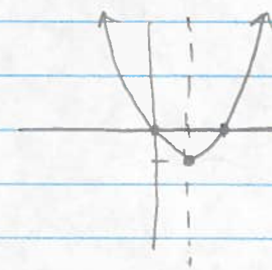
57. $f(x)=2x^2-4x+1$

$y=2(x^2-2x+\underline{1})+1-2$

$\boxed{y=2(x-1)^2-1}$

Parabola, up

D: $\mathbb{R}$
R: $y\geq -1$
V$(1,-1)$
Symm: $x=1$



58. a. $7=4.2^x$

$\log_{4.2}(7)=x$

$\boxed{x=1.356}$

b. $3x^5=126$

$\sqrt[5]{x^5}=\sqrt[5]{\frac{126}{3}}$

$\boxed{x=2.112}$

c. $14=2(4)^x-10$

$24=2(4)^x$

$12=4^x$

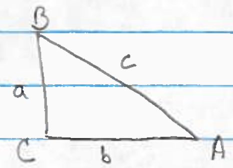
$\log_4(12)=x$

$\boxed{x=1.792}$

59.

Lesson 12.1.4 (day 1) p. 637-638: 67-71, 74

67



a. $\sin A = \boxed{\frac{a}{c}}$

b. $\sec A = \frac{1}{\cos A} = \frac{1}{\frac{b}{c}} = \boxed{\frac{c}{b}}$

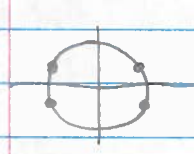
c. $\csc B = \frac{1}{\sin B} = \frac{1}{\frac{b}{c}} = \boxed{\frac{c}{b}}$

d. $\tan B = \boxed{\frac{b}{a}}$

68. a. $4\sin^2(x) = 1$

$\sqrt{\sin^2(x)} = \sqrt{\frac{1}{4}}$

$\sin(x) = \pm\frac{1}{2}$

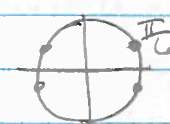


$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \quad x = \frac{-\pi}{6}, \frac{-5\pi}{6}, \frac{-7\pi}{6}, \frac{-11\pi}{6}}$

b. $3\tan^2(x) = 1$

$\sqrt{\tan^2(x)} = \sqrt{\frac{1}{3}}$

$\tan(x) = \pm\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$



$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \quad x = \frac{-\pi}{6}, \frac{-5\pi}{6}, \frac{-7\pi}{6}, \frac{-11\pi}{6}}$

$\tan = \frac{\sin}{\cos} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}}$

69. $2\sin(x)\cos(x) - \sin(x) = 0$

$\sin(x)(2\cos(x) - 1) = 0$

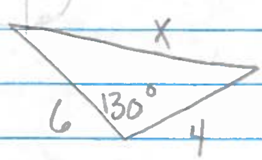
$\sin(x) = 0 \qquad 2\cos(x) - 1 = 0$

$2\cos(x) = 1$

$\cos(x) = \frac{1}{2}$

$\boxed{\begin{array}{l} \sin(x) = 0 \text{ when } x = 0, \pi, 2\pi \\ \cos(x) = \frac{1}{2} \text{ when } x = \frac{\pi}{3}, \frac{5\pi}{3} \end{array}}$

70.



$x^2 = 6^2 + 4^2 - 2(6)(4)\cos(130°)$

$\sqrt{x^2} = \sqrt{82.85}$

$\boxed{x = 9.10}$

use law of cosines

use Degree mode

71. $y = a(b)^x$

(now)	0	15.95
	1	
	2	
	3	
	4	21.95

$)b$ $)b$ $)b$ $)b$

$b^4 = \frac{21.95}{15.95}$

$b^4 = 1.38$

$\boxed{b = 1.083}$

$\boxed{\%\text{ increase} = 8.3\%}$

or

$21.95 = 15.95(b)^4$

$b^4 = 1.38$

$\boxed{b = 1.083 \quad \% \uparrow = 8.3\%}$

74. cubic eqn thru $(-6, 10)$ & origin

$y = a(x-h)^3 + k$

$y = a(x+6)^3 - 10$

$0 = a(0+6)^3 - 10$

$0 = 216a - 10$

$216a = 10$

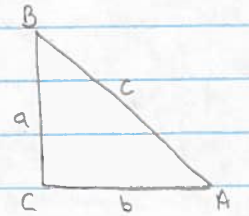
$a = \frac{10}{216}$

$a = \frac{5}{108}$

$\boxed{y = \frac{5}{108}(x+6)^3 - 10}$

Lesson 12.1.4 (day 2) p.638-639: 76-83 (omit 79, 82)

76.



a. $\sec B = \frac{1}{\cos B} = \frac{1}{\frac{a}{c}} = \boxed{\frac{c}{a}}$

b. $\tan A = \boxed{\frac{a}{b}}$ c. $\cot A = \frac{1}{\tan A} = \frac{1}{\frac{a}{b}} = \boxed{\frac{b}{a}}$

d. $\csc A = \frac{1}{\sin A} = \frac{1}{\frac{a}{c}} = \boxed{\frac{c}{a}}$

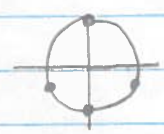
77. $2\sin(x)\cos(x) + \cos(x) = 0$

$\cos(x)\left(2\sin(x)+1\right) = 0$

$\cos(x) = 0$ $2\sin(x)+1=0$

$2\sin(x) = -1$

$\sin(x) = \frac{-1}{2}$



$\cos(x) = 0$ when $x = \frac{\pi}{2} + \pi n$

$\sin(x) = \frac{-1}{2}$ when $x = \frac{7\pi}{6} + 2\pi n$

$x = \frac{11\pi}{6} + 2\pi n$

78. $f(x) = 2x^2 - 3$ and $g(x) = x+1$

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

1	x	1
x	x^2	x
	x	1

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

$2x^2 + 4x + 2 - 3$

$\boxed{2x^2 + 4x - 1}$

80. (3,3) is the locator point, so

$y = a(x-3)^3 + 3$, Goes thru (5, 4)

$4 = a(5-3)^3 + 3$

$4 = a(2)^3 + 3$

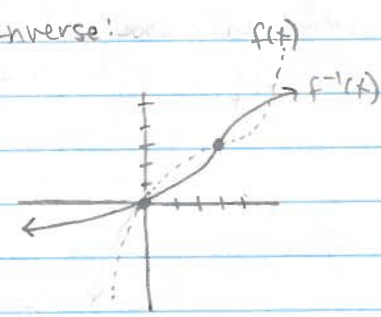
$4 = 8a + 3$

$1 = 8a$

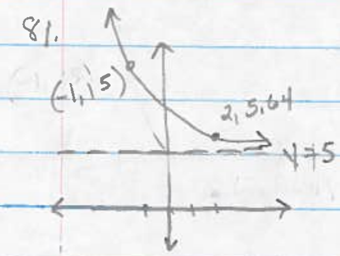
$a = \frac{1}{8}$

$\boxed{y = \frac{1}{8}(x-3)^3 + 3}$

Inverse:



81.



shift the graph down 5 units

x	y
-1	10
0	4
2	.64

$\times .4$

$b^3 = \frac{.64}{10}$

$b^3 = .064$

$b = .4$

$a = 10(.4) = 4$

$\boxed{y = 4(.4)^x + 5}$

shift back up 5

83. $x = 3 + 5i$, $x = 3 - 5i$

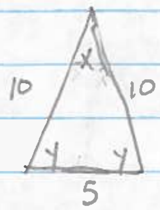
$(x - 3 - 5i)(x - 3 + 5i) = 0$

			25
$-5i$	$\cancel{-5xi}$	$\cancel{15i}$	$-25i^2$
-3	$-3x$	9	$\cancel{-15i}$
x	x^2	$-3x$	$\cancel{5xi}$
	x	-3	$5i$

$\boxed{x^2 - 6x + 34 = 0}$

Lesson 12.2.1 (day 1) p.6 : 91–94, 97, 100, 101

91.



(degree mode)

law of cosines

$5^2 = \underbrace{10^2 + 10^2}_{} - 2(10)(10)\cos X$

$25 = 200 - 200\cos X$

$-175 = -200\cos X$

$\cos X = .875$

$\boxed{X = 28.96°}$

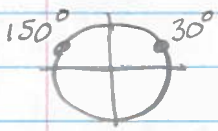
$180 = 28.96 + 2y$

⋮

$\boxed{y = 75.52°}$

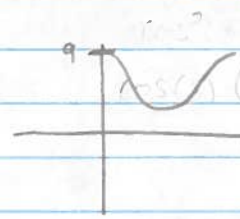
92. a. $2\sin(x) = 1$

$\sin(x) = \frac{1}{2}$



$\boxed{\begin{array}{l} x = 30° + 360°n \\ x = 150° + 360°n \end{array}}$

b. $\cos^2(x) + 4\cos(x) + 4 = 0$



the graph never touches 0, so

$\boxed{\text{NO solution}}$

93. $(6x^3 - 5x^2 + 5x - 2) \div (2x - 1) = \boxed{3x^2 - x + 2}$

	$3x^2$	$-x$	2
$2x$	$6x^3$	$-2x^2$	$4x$
-1	$-3x^2$	x	-2

$6x^3 \quad -5x^2 \quad 5x \quad -2$

94. $(x^4 - 7x^2 + 3x + 18) \div (x + 2) = \boxed{x^3 - 2x^2 - 3x + 9}$

	x^3	$-2x^2$	$-3x$	9
x	x^4	$-2x^3$	$-3x^2$	$9x$
2	$2x^3$	$-4x^2$	$-6x$	18

$x^4 \quad 0x^3 \quad -7x^2 \quad 3x \quad 18$

97. $f(x) = x^2 + 7x$

a. $f(2) = 2^2 + 7(2) = 4 + 14 = \boxed{18}$

b. $f(-3) = (-3)^2 + 7(-3) = 9 - 21 = \boxed{-12}$

c. $f(i) = (i)^2 + 7(i) = \boxed{-1 + 7i}$

d. $f(-3.5 + 1.5i) = (-3.5 + 1.5i)^2 + 7(-3.5 + 1.5i)$

-2.25

$1.5i$	$-5.25i$	$2.25i^2$
-3.5	12.25	$-5.25i$
	-3.5	$1.5i$

$10 - \cancel{10.5i} - 24.5 + \cancel{10.5i}$

$\boxed{-14.5}$

e. x if $f(x) = 0$

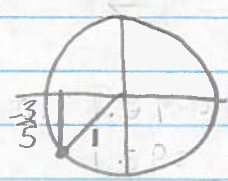
$0 = x^2 + 7x$

$0 = x(x+7)$

$\boxed{x = 0,\ x = -7}$

100. $\pi \le \theta \le \frac{3\pi}{2}$, $\sin\theta = -\frac{3}{5}$, find $\cos\theta$.

(3^{rd} Quad)



$\sin^2\theta + \cos^2\theta = 1$

$\left(-\frac{3}{5}\right)^2 + \cos^2\theta = 1$

$\frac{9}{25} + \cos^2\theta = 1$

$\cos^2\theta = \frac{25}{25} - \frac{9}{25}$

$\sqrt{\cos^2\theta} = \sqrt{\frac{16}{25}}$

$\cos\theta = \pm\frac{4}{5}$

Since cos is neg in Quad. 3,

$\boxed{\cos\theta = \frac{-4}{5}}$

101. a. $\tan(\theta)$ $\boxed{\frac{\sin(\theta)}{\cos(\theta)}}$

b. $\csc(\theta)$ $\boxed{\frac{1}{\sin(\theta)}}$

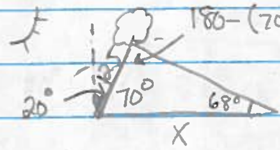
c. $\cot(\theta)$ $\boxed{\frac{\cos(\theta)}{\sin(\theta)}}$

d. $\sec(\theta)$ $\boxed{\frac{1}{\cos(\theta)}}$

~~109, 111-112, 114-115, 117abc~~

Lesson 12.2.2 (day 1) p. 646-647: 109, 111-112, 114-115, 117abc

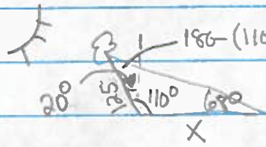
109.



$$\frac{\sin 68}{125} = \frac{\sin 42}{X}$$

$$X = \frac{125\sin(42)}{\sin(68)} = \boxed{90.2\text{ ft}}$$

or



$$\frac{\sin(68)}{125} = \frac{\sin(2)}{X}$$

$$X = \frac{125\sin(2)}{\sin(68)} = \boxed{4.7\text{ ft}}$$

111. a. $\sin(x) = -1$

$\boxed{x = \frac{3\pi}{2}}$

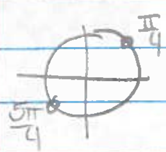
b. $2\cos(x) - 1 = 0$

$2\cos(x) = 1$

$\cos(x) = \frac{1}{2}$

$\boxed{x = \frac{\pi}{3}, \frac{5\pi}{3}}$

c. $\tan(x) = 1$



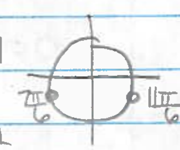
$\boxed{x = \frac{\pi}{4}, \frac{5\pi}{4}}$

d. $2\sin(x) = 4\sin(x) + 1$

$2\sin(x) - 4\sin(x) = 1$

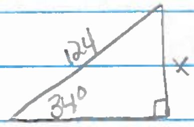
$-2\sin(x) = 1$

$\sin(x) = -\frac{1}{2}$



$\boxed{x = \frac{7\pi}{6}, \frac{11\pi}{6}}$

112. a.

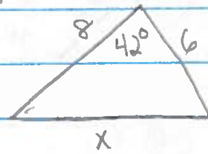


$\sin(34°) = \frac{x}{124}$

$x = 124\sin(34)$

$\boxed{x = 69.34}$

b

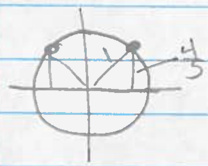


$x^2 = 6^2 + 8^2 - 2(6)(8)\cos(42°)$

$\sqrt{x^2} = \sqrt{28.66}$

$\boxed{x = 5.35}$

114. $\left(?, \frac{4}{5}\right)$



$\cos^2\theta + \sin^2\theta = 1$

$\cos^2\theta + \left(\frac{4}{5}\right)^2 = 1$

$\cos^2\theta = \frac{25}{25} - \frac{16}{25}$

$\sqrt{\cos^2\theta} = \sqrt{\frac{9}{25}}$

$\cos\theta = \pm\frac{3}{5}$

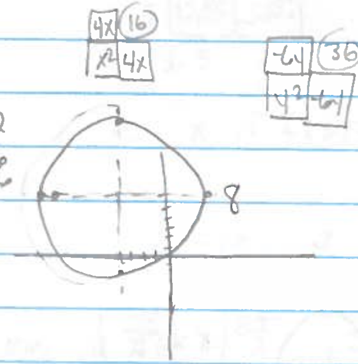
$\boxed{\left(\pm\frac{3}{5}, \frac{4}{5}\right)}$

115. Complete the square

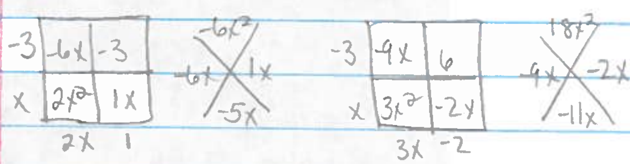
$x^2 + 8x + y^2 - 12y = 12$

$(x^2 + 8x + \underline{16}) + (y^2 - 12y + \underline{36}) = 12$
$+16$
$+36$

$\boxed{\begin{array}{c}(x+4)^2 + (y-6)^2 = 64 \\ \text{Circle, } C(-4, 6),\ r = 8\end{array}}$



117. a. $\frac{2x^2 - 5x - 3}{3x^2 - 11x + 6} = \frac{(\cancel{x-3})(2x+1)}{(\cancel{x-3})(3x-2)} = \boxed{\frac{2x+1}{3x-2}}$



b.

Lesson 12.2.1 (day 2) p.6 : 90, 99, 102-106

90. a. $\cos^2(\theta-\pi) + \sin^2(\theta-\pi)$

$\boxed{1}$

Pyth. Identity

b. $\cos^2(2w) - \sin^2(2w)$

$\cos(2(2w))$

$\boxed{\cos(4w)}$

c. $\frac{\sin(\theta)}{\cos(\theta)} = \boxed{\tan(\theta)}$

99. $\cos^2(x) + \sin^2(x) = 1$

$\sqrt{\cos^2(x)} = \sqrt{1-\sin^2(x)}$

$\boxed{\cos(x) = \pm\sqrt{1-\sin^2(x)}}$

$\cos^2(x) + \sin^2(x) = 1$

$\sqrt{\sin^2(x)} = \sqrt{1-\cos^2(x)}$

$\boxed{\sin(x) = \pm\sqrt{1-\cos^2(x)}}$

$\cos^2(x) + \sin^2(x) = 1$

$\boxed{\cos^2(x) = 1-\sin^2(x)}$

$\cos^2(x) + \sin^2(x) = 1$

$\boxed{\sin^2(x) = 1-\cos^2(x)}$

$\cos^2(x) + \sin^2(x) = 1$

$\cos^2(x) = 1-\sin^2(x)$

$\boxed{\cos^2(x) = (1+\sin(x))(1-\sin(x))}$

$\cos^2(x) + \sin^2(x) = 1$

$\sin^2(x) = 1-\cos^2(x)$

$\boxed{\sin^2(x) = (1+\cos(x))(1-\cos(x))}$

102. (2, 9) and (4, 324)

a. $m = \frac{324-9}{4-2} = \frac{315}{2} = 157.5$

$y = mx + b$

$9 = 157.5(2) + b$

$9 = 315 + b$

$b = -306$

$\boxed{y = 157.5x - 306}$

Linear

b.

0	.25
1	
2	9
3	
4	324

$b^2 = \frac{324}{9} = 36$

$b = 6$

$\boxed{y = .25(6)^x}$

Exponential

103. $f(x) = 2x^2 - 3x + 1$ and $g(x) = 4x - 2$

$$2x^2 - 3x + 1 = 4x - 2$$
$$2x^2 - 7x + 3 = 0$$

-3	$-6x$	3
x	$2x^2$	$-1x$
	$2x$	-1

$6x^2$

$-6x \quad -1x$

$-7x$

$$(x-3)(2x-1)=0$$
$$3, \quad \tfrac{1}{2}$$

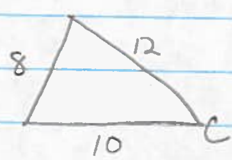
$\boxed{(3,10) \quad (\tfrac{1}{2}, 0)}$

$y = 4(3) - 2 = 10$

$y = 4(\tfrac{1}{2}) - 2 = 0$

104. a. $\dfrac{\frac{x+1}{2x}}{\frac{x^2-1}{x}} = \dfrac{x+1}{2x} \cdot \dfrac{x}{x^2-1} = \dfrac{\cancel{x+1}}{2\cancel{x}} \cdot \dfrac{\cancel{x}}{\cancel{(x+1)}(x-1)} = \boxed{\dfrac{1}{2(x-1)}}$

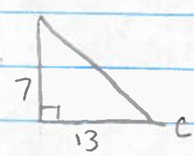
b. $\dfrac{\frac{4}{x+3}}{\frac{1}{x} + \frac{3x}{x}} = \dfrac{4}{x+3} \cdot \dfrac{x}{1+3x} = \boxed{\dfrac{4x}{(x+3)(3x+1)}}$

105. a. 

$$8^2 = 10^2 + 12^2 - 2(10)(12)\cos C$$
$$64 = 244 - 240 \cos C$$
$$-180 = -240 \cos C$$

(degree mode)

$$\cos C = .75$$
$$\boxed{m\angle C = 41.41^\circ}$$

b. 

$\tan C = \frac{7}{13}$

$\boxed{m\angle C = 28.3^\circ}$

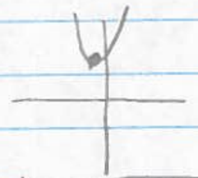
106. $f(x) = 5x^2 + 4x + 20$

$$x = \frac{-4 \pm \sqrt{16 - 4(5)(20)}}{2(10)}$$

$$= \frac{-4 \pm \sqrt{-384}}{10} < {}^{64}_{6}$$

$$= \frac{-\cancel{4}^{-2} \pm \cancel{8}^{4} i\sqrt{6}}{\cancel{10}\ 5}$$

Roots: $= \boxed{\dfrac{-2 \pm 4i\sqrt{6}}{5}}$



$\boxed{V(-.4, 19.2)}$

graphing form:

$\boxed{y = 5(x + .4)^2 + 19.2}$

Lesson 12.2.2 (day 2) p. 647-648: 118-120, 122-123, 126

118. a. $(\sin\theta + \cos\theta)^2 = 1 + 2\sin\theta\cos\theta$

	$\sin\theta$	$\cos\theta$
$\cos\theta$	$\cos\theta\sin\theta$	$\cos^2\theta$
$\sin\theta$	$\sin^2\theta$	$\sin\theta\cos\theta$

$= \sin^2\theta + 2\sin\theta\cos\theta + \cos^2\theta$

$\underbrace{\sin^2\theta + \cos^2\theta}_{} + 2\sin\theta\cos\theta$

$\boxed{1 + 2\sin\theta\cos\theta}$ ✓

b. $\tan\theta + \cot\theta = \sec\theta\csc\theta$

$\frac{\sin\theta}{\sin\theta}\cdot\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\cdot\frac{\cos\theta}{\cos\theta}$

$\frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \frac{1}{\sin\theta\cos\theta} = \frac{1}{\sin\theta}\cdot\frac{1}{\cos\theta} = \boxed{\csc\theta\sec\theta}$ ✓

c. $(\tan\theta\cos\theta)\left(\sin^2\theta + \frac{1}{\sec^2\theta}\right) = \sin\theta$

$\left(\frac{\sin\theta}{\cancel{\cos\theta}}\cdot\frac{\cancel{\cos\theta}}{1}\right)(\sin^2\theta + \cos^2\theta)$

$\sin\theta \cdot 1$

$\boxed{\sin\theta}$

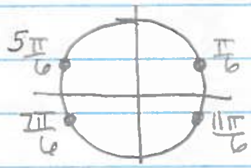
119. $\cancel{3}\cdot\frac{2 + \sin^2\theta}{\cancel{3}} = \frac{3}{4}\cdot 3$

$2 + \sin^2\theta = \frac{9}{4}$

$\sin^2\theta = \frac{9}{4} - \frac{8}{4}$

$\sqrt{\sin^2\theta} = \sqrt{\frac{1}{4}}$

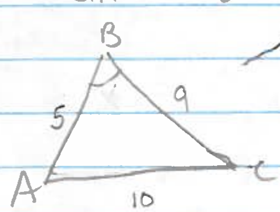
$\sin\theta = \pm\frac{1}{2}$



$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}}$

✓

120.



$10^2 = 5^2 + 9^2 - 2(5)(9)\cos B$

$100 = 106 - 90\cos B$

$-6 = -90\cos B$

$\cos B = .066\overline{6}$

$\cos^{-1}(.066\overline{6}) = \boxed{86.18^\circ}$

122. a. $27 = 6^x$

$\log_6(27) = x$

$\boxed{x = 1.839}$

b. $\frac{27}{1} = \frac{1}{6^x}$

$27(6^x) = 1$

$6^x = \frac{1}{27}$

$\log_6\left(\frac{1}{27}\right) = x$

$\boxed{x = -1.839}$

c. $27 = \frac{1}{\left(\frac{1}{6}\right)^x}$

$27 = \left(\frac{1}{6}\right)^{-x}$

$\log_{\left(\frac{1}{6}\right)}(27) = -x$

$-x = -1.839$

$\boxed{x = 1.839}$

d. Show that $\frac{1}{\left(\frac{1}{6}\right)^x} = 6^x$

$\frac{1}{\left(\frac{1}{6}\right)^x} = \left(\frac{1}{6}\right)^{-x} = \left(\frac{6}{1}\right)^x = \boxed{6^x}$

123. a. $3x - 2y = -10$

$4x + y = 49$

$y = -4x + 49$

$3x - 2(-4x + 49) = -10$

$3x + 8x - 98 = -10$

$11x = 88$

$x = 8, \quad y = -32 + 49 = 17$

$\boxed{(8, 17)}$ lines intersect at this pt.

b. $(7x - 2y = 11) \cdot 2$

$14x - 4y = 3$

$-14x + 4y = -22$

$0 = -19$

False means $\boxed{\text{No solution}}$ and the lines are parallel.

126. $x = 3, \quad x = 1 + i, \quad x = 1 - i$

$(x - 3)(x - 1 - i)(x - 1 + i)$

$-i$	$\cancel{-xi}$	$\cancel{i}$	$-i^2$
-1	$-x$	1	$\cancel{-i}$
x	x^2	$-x$	$\cancel{xi}$
	x	-1	i

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

$= \boxed{x^3 - 5x^2 + 8x - 6 = f(x)}$

$(x - 3)(x^2 - 2x + 2)$

omit 138a, 139c, 141a, 143

Chapter 12 Closure p. 656 : 138 - 148 (omit 138a, 139c, 141a, 143)

138. b. $2\tan(x)=0$

$\tan(x)=0$

Sometimes true when $x=\pi n$

c. $\sin(x)=\frac{5}{2}$

Never true b/c $\sin(x)$ cannot be greater than 1

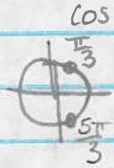
d. $\sin(x)=\cos(\frac{\pi}{2}-x)$

$\sin(x)=\sin(x)$

Always true b/c this is an identity

139. a. $2\cos(x)=1$

$\cos(x)=\frac{1}{2}$

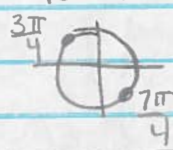


$\boxed{x=\frac{\pi}{3}, \frac{5\pi}{3}}$

b. $4\tan(x)+4=0$

$4\tan(x)=-4$

$\tan(x)=-1$



$\boxed{x=\frac{3\pi}{4}, \frac{7\pi}{4}}$

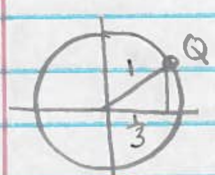
c. $\csc(x)=-2$

$\frac{1}{\sin(x)}=\frac{-2}{1}$

$\sin(x)=-\frac{1}{2}$

$\boxed{x=\frac{7\pi}{6}, \frac{11\pi}{6}}$

140a.



$\sin^2\theta+\cos^2\theta=1$

$\sin^2\theta+\left(\frac{1}{3}\right)^2=1$

$\sin^2\theta+\frac{1}{9}=1$

$\sqrt{\sin^2\theta}=\sqrt{\frac{8}{9}}$

$\sin\theta=\pm\frac{\sqrt{8}}{3}$

$\sin\theta=\frac{\sqrt{8}}{3}$

$\boxed{Q\left(\frac{1}{3}, \frac{\sqrt{8}}{3}\right)}$

141. b. $\cos(x)=-1$

$\boxed{x=\pi}$

c. $\frac{1}{4}\csc(x)=\sin(x)$

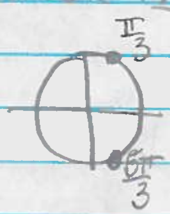
$\cancel{\sin x}\cdot\frac{1}{4}\cdot\frac{1}{\cancel{\sin(x)}}=\sin(x)\cdot\sin x$

$\sqrt{\frac{1}{4}}=\sqrt{\sin^2(x)}$

$\sin(x)=\pm\frac{1}{2}$

$\boxed{x=\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}}$

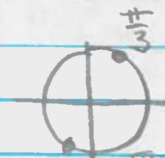
141 d. $\cos(2x) = \frac{1}{2}$



$2x = \frac{\pi}{3}, \frac{7\pi}{3} \Rightarrow \boxed{x = \frac{\pi}{6}, \frac{7\pi}{6}}$

$2x = \frac{5\pi}{3}, \frac{11\pi}{3} \Rightarrow \boxed{x = \frac{5\pi}{6}, \frac{11\pi}{6}}$

142. a. $\tan(x) = \sqrt{3}$



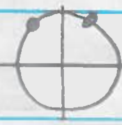
$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{4\pi}{3} + 2\pi n}$ or $\boxed{x = \frac{\pi}{3} + \pi n}$

$\frac{\sin}{\cos} = \frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \sqrt{3}$

b. $\cos(x) = \frac{-\sqrt{2}}{2}$

$\boxed{x = \frac{3\pi}{4} + 2\pi n \quad x = \frac{5\pi}{4} + 2\pi n}$

c. $\sin(x) = \frac{\sqrt{3}}{2}$



$\boxed{x = \frac{\pi}{3} + 2\pi n \quad x = \frac{2\pi}{3} + 2\pi n}$

d. $\cot(x) = -1$

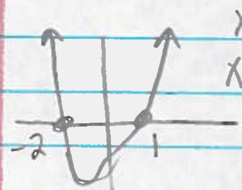
$\tan(x) = -1$

$\boxed{x = \frac{3\pi}{4} + 2\pi n \quad x = \frac{7\pi}{4} + 2\pi n}$ or $\boxed{x = \frac{3\pi}{4} + \pi n}$

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

$x = -2 \Rightarrow x + 2$

$x = 1 \Rightarrow x - 1$



	x^3	$-x^2$	$2x$	-2
x	x^4	$-x^3$	$2x^2$	$-2x$
2	$2x^3$	$-2x^2$	$4x$	-4

$x^4 \quad x^3 \quad 0x^2 \quad 2x \quad -4$

	x^2	$0x$	2
x	x^3	$0x$	$2x$
-1	$-x^2$	$0x$	-2

$x^3 \quad -x^2 \quad 2x \quad -2$

$x^2 + 2 = 0$

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

$x = \pm i\sqrt{2}$

$\boxed{x = -2, 1, \pm i\sqrt{2}}$

145. a. $f(x) = x^2 + 8x + 12$

$4x$	16
x^2	$4x$

$$\begin{array}{l} y - 12 = x^2 + 8x + 16 \\ +16 \\ \hline y + 4 = (x+4)^2 \\ y = (x+4)^2 - 4 \end{array}$$

$\boxed{v(-4, -4)}$

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

$-1x$	1
x^2	$-1x$

$$\begin{array}{l} y - 3 = x^2 - 2x + 1 \\ +1 \\ \hline y - 2 = (x-1)^2 \\ y = (x-1)^2 + 2 \end{array}$$

$\boxed{v(1, 2)}$

146. double root at $x=-2$, $x=0$, $x=2$ b/c of the bounces; neg orientation

$y = -(x+2)^2 x^2 (x-2)^2$ or $\boxed{y = -x^2 (x+2)^2 (x-2)^2}$

147. a. $5^x = 72$

$\log_5 (72) = x$

$\vdots$

$\boxed{x = 2.66}$

b. $2^{3x} = 7$

$\log_2 (7) = 3x$

$\vdots$

$\boxed{x = .94}$

c. $3^{(2x+4)} = 17$

$\log_3 (17) = 2x + 4$

$\vdots$

$\boxed{x = -.71}$