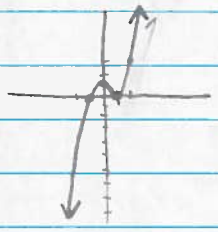
Lesson 8.1.1 (day 1) p. 374-376: 8-16

8. a. $y = (x-1)^2(x+1)$

-2	-9
-1	0
0	1
1	0
2	3

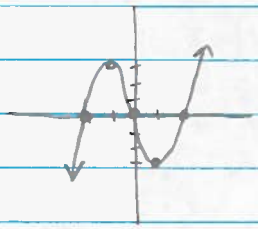


b. $y = (x-1)^2(x+1)^2$

-2	9
-1	0
0	1
1	0
2	9

c. $y = x^3 - 4x$

-2	0
-1	3
0	0
1	-3
2	0



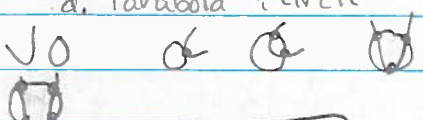
d. part a: $y = x^3$
part b: $y = x^4$
part c: $y = x^3$

9. a. yes
b. yes
c. NO
d. NO
e. yes

c. and d. fit the form $y = (\text{any \#}) \cdot x^{(\text{whole \#})}$

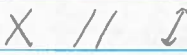
f. $y = 4x^2 - 2x + 7$
$y = 3(2)^x$

d. Parabola & circle



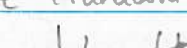
0, 1, 2, 3, 4 solutions

10a. 2 different lines



1, 0, All solutions

b. line & Parabola



0, 1, 2 solutions

c. 2 Parabolas

0, 1, 2, 3, 4 solutions

11. $y = x^2 - 5$ $\quad$ $x^2 - 5 = x + 1$

$y = x + 1$ $\quad$ $x^2 - x - 6 = 0$

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

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

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

$x = 3$ $\quad$ $x = -2$

$y = 4$ $\quad$ $y = -1$

$(3, 4)$, $(-2, -1)$

12. a.

	1st	2nd	3rd	4th
$g \to x$	adds 1	$(\ )^2$	$\div 3$	-2
$g^{-1} \to x$	$+2$	$* 3$	$\sqrt{\ }$	-1

b. $f^{-1}(x) = \left(\frac{x-3}{2}\right)^2 + 1$ $\quad$ $g^{-1}(x) = \sqrt{3(x+2)} + 1$

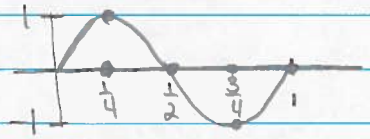
13. $y = x^3 - x$ and $y = x^3 - x + 5$

The 2nd graph is shifted up 5 units

14. a. $y = \sin(2\pi x)$

$P = \frac{2\pi}{2\pi}$

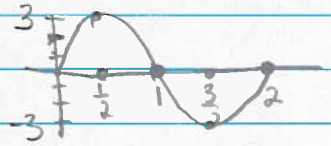
$P = 1$



b. $y = 3\sin(\pi x)$

$P = \frac{2\pi}{\pi}$

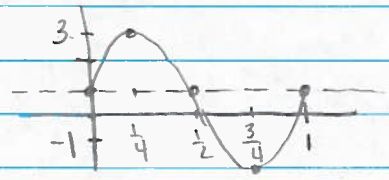
$P = 2$



c. $y = 2\sin(2\pi x) + 1$

$P = \frac{2\pi}{2\pi}$

$P = 1$



15. Arithmetic (-27) $-23, -19, -15, \ldots$ (-4, +4, +4)

a. $t(n) = -27 + 4n$

b. $-27 + 4n > 10{,}000$

$-27 + 4n = 10{,}000$

$4n = 10{,}027$

$n = 2506.75$

$n > 2506.75$

$n = 2507$

16. a. $\cos\theta = \frac{1}{2}$

$\theta = \frac{\pi}{3}, \frac{5\pi}{3}$

or

$\theta = 60°, 300°$

b. $\tan\theta = -1$ $\quad \tan = \frac{\sin}{\cos}$

$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$

or

$\theta = 135°, 315°$

c. $\sin\theta = \frac{\sqrt{3}}{2}$

$\theta = \frac{\pi}{3}, \frac{2\pi}{3}$

or

$\theta = 60°, 120°$

d. $\cos\theta = \frac{-\sqrt{3}}{2}$

$\theta = \frac{5\pi}{6}, \frac{7\pi}{6}$

or

$\theta = 150°, 210°$

Lesson 8.1.1 (day 2) p. 377-378; 17-25

17. a. yes b. yes c. NO b/c 2^x (x is an exponent) d. yes e. yes

f. NO b/c x & y are both squared g. NO b/c $\frac{1}{x^2} = x^{-2}$ and $-2 \neq$ whole # h. yes i. yes j. yes

18. NO b/c $(x-4)^2 + (y-3)^2 = 25$ $\stackrel{?}{=}$ $(x-4)+(y-3)=5$

The graph is a circle

$x + y - 7 = 5$

$x + y = 12$

$y = 12 - x$

The graph is a line

19. a. $y = x^2 - 6x + 8$

$0 = x^2 - 6x + 8$

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

$8x^2$, $-4x$, $-2x$, $-6x$

$(x-4)(x-2)=0$

$x=4,\ x=2$

b. $f(x) = x^2 - 6x + 9$

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

-3	-3x	9
x	x^2	-3x
	x	-3

$9x^2$, $-3x$, $-3x$, $-6x$

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

$x=3$ (twice)

c. $y = x^3 - 4x$

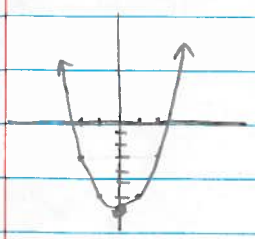
$0 = x^3 - 4x$

$0 = x(x^2 - 4)$

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

$x=0,\ x=-2,\ x=2$

20. $y = x^2 - 7$ Parabola, up, v(0, -7)



a. 2 roots

b. $0 = x^2 - 7$

$\sqrt{7} = \sqrt{x^2}$

$x = \pm\sqrt{7}$

21. $x^2+2x-5=0$ QF $x=\frac{-2\pm\sqrt{4-4\cdot1\cdot-5}}{2\cdot1}$

	-5
x^2	

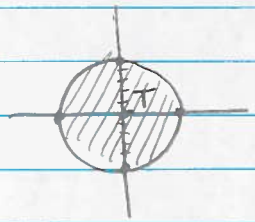
$-5x$, $2x$

$x=\frac{-2\pm\sqrt{24}}{2}=\frac{-2\pm2\sqrt{6}}{2}=\boxed{-1\pm\sqrt{6}}$

doesn't factor

or $\boxed{x=1.45,\ x=-3.45}$

22. $x^2+y^2\leq 25$ Circle, $C(0,0)$ $r=5$



check $(0,0)$

$0\leq 25$

T

23. $2^{P(x)}=4$ and $P(x)=x^2-4x-3$

con. $2^{x^2-4x-3}=4$

-5	$-5x$	-5
x	x^2	$1x$
	x	1

$-5x^2$, $-5x$, $1x$, $-4x$

$\log_2(4)=x^2-4x-3$

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

$0=x^2-4x-5$

$(x-5)(x+1)=0$

$\boxed{x=5,\ x=-1}$

24. $y=3^x$

a. Down 4 units

$\boxed{y=3^x-4}$

b. Right 7 units

$\boxed{y=3^{(x-7)}}$

25.

θ	$-90°$	$-45°$	$0°$	$45°$	$90°$	$135°$	$180°$	...	$270°$
ht	-30	-21.21	0	21.21	30	21.21	0		-30

$\frac{\sqrt{2}}{2} \cdot 30$

60 ft. diam = 30 ft radius

a. Add more cycles

b. 30 ft.

c. $y = 30 \sin x$

Lesson 8.1.2 p. 382-383: 36-44

36. $y = (x+3)^2 - 5$

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

$\sqrt{5} = \sqrt{(x+3)^2}$

$\pm\sqrt{5} = x+3$

$x = -3 \pm \sqrt{5}$

$(-3 \pm \sqrt{5}, 0)$

37. $f(x) = (x-74)^2(x+29)$

intersect the x-axis at

$(74, 0)$ and $(-29, 0)$

38. a. $(-3, 0)$ and $(2, 0)$

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

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

$y = x^2 + x - 6$

b. $(-3, 0)$ and $(\frac{1}{2}, 0)$

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

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

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

39. a. Degree = 2

b. Degree = 5

c. Degree = 3

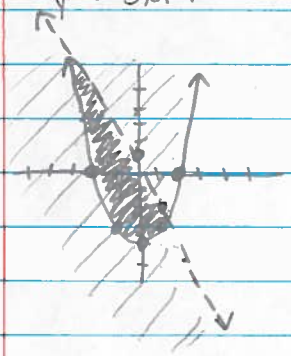
d. Degree = 6

40. Parabolas, Cubics & Lines are polynomial functions b/c they can all be written in the form $y = ax^n$

- Circles are not functions
- Exponentials has the variable as an exponent

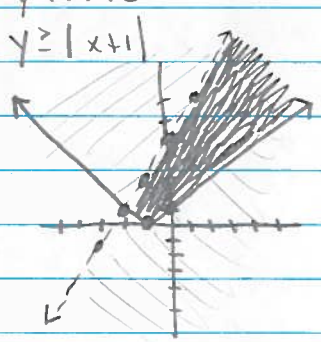
41. a. $y \geq x^2 - 4$

$y < -3x + 1$

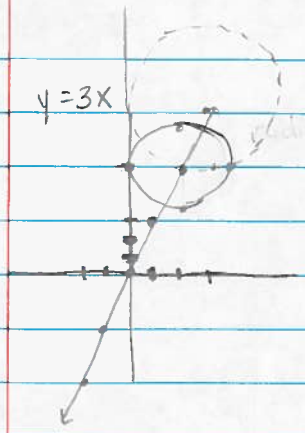


b. $y < 2x + 5$

$y \geq |x+1|$



42. $y = 3x$



if $r=2$, then $C(2,6)$

Eqn: $\boxed{(x-2)^2+(y-6)^2=4}$

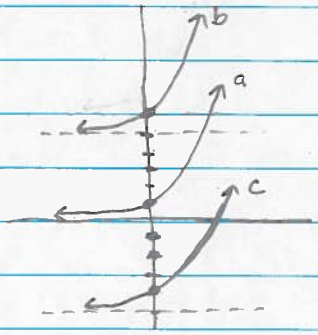
if $r=3$, the $C(3,9)$

Eqn: $\boxed{(x-3)^2+(y-9)^2=9}$

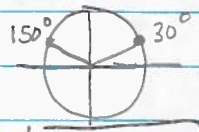
43. a. $y = 2^x$

b. $y = 2^x + 5$

c. $y = 2^x - 5$

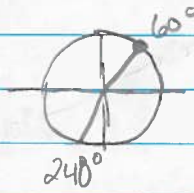


44. a. $\sin\theta = \frac{1}{2}$



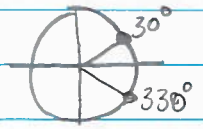
$\boxed{30°, 150°}$

b. $\tan\theta = \sqrt{3}$ $\quad \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} \cdot \frac{2}{1} = \sqrt{3}$



$\boxed{60°, 240°}$

c. $\cos\theta = \frac{\sqrt{3}}{2}$



$\boxed{30°, 330°}$

d. $\sin\theta = -\frac{\sqrt{2}}{2}$

$\boxed{225°, 315°}$

Lesson 8.1.3 p. 387-388: 54-62

54. $y = a(x+2)^2(x-1)$ check $(0, 8)$

$8 = a(2)^2(-1)$

$8 = -4a$

$a = -2$

$y = -2(x+2)^2(x-1)$

Stretch factor $= -2$

55. a. $6x^4 - 3x^3 + 5x^2 + x + 8$

Degree $= 4$

Coeff: $a_4 = 6$, $a_3 = -3$, $a_2 = 5$, $a_1 = 1$, $a_0 = 8$

b. $-5x^3 + 10x^2 + 8$

Degree $= 3$

Coeff: $a_3 = -5$, $a_2 = 10$, $a_1 = 0$, $a_0 = 8$

c. $-x^2 + x$

Degree: 2

Coeff: $a_2 = -1$, $a_1 = 1$, $a_0 = 0$

d. $x(x-3)(x-5)$

$x(x^2 - 8x + 15)$

-3	$-3x$	15
x	x^2	$-5x$
	x	-5

$x^3 - 8x^2 + 15x$

Degree $= 3$

Coeff: $a_3 = 1$, $a_2 = -8$, $a_1 = 15$, $a_0 = 0$

e. x

Degree $= 1$

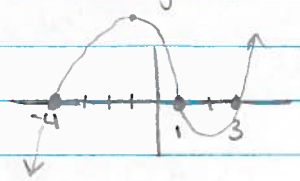
Coeff: $a_1 = 1$, $a_0 = 0$

f. 10

Degree $= 0$

Coeff: $a_0 = 10$

56. Passes through $(-1, 60)$ with 3 x-int's at $(-4, 0)$, $(1, 0)$ and $(3, 0)$



$y = a(x+4)(x-1)(x-3)$

$60 = a(3)(-2)(-4)$

$60 = 24a$

$a = \frac{60}{24}$

$a = \frac{5}{2}$

$y = 2.5(x+4)(x-1)(x-3)$

57. a. $x = \frac{3}{4}, \; x = -2$

$y = (4x-3)(x+2)$

-3	$-3x$	-6
$4x$	$4x^2$	$8x$
	x	2

$y = 4x^2 + 5x - 6$

b. $x = -\sqrt{5}, \; x = \sqrt{5}$

$y = (x+\sqrt{5})(x-\sqrt{5})$

$\sqrt{5}$	$x\sqrt{5}$	-5
x	x^2	$-x\sqrt{5}$
	x	$-\sqrt{5}$

$y = x^2 - 5$

58. $\sqrt{5-2x} + 7 = 4$

$\sqrt{5-2x} = -3$

NO solution b/c the $\sqrt{\ }$ of a number will never be negative!

59. a. $(y-7)^2 = 25 - (x-3)^2$

$(x-3)^2 + (y-7)^2 = 25$

$C(3,7), \; r=5$

b. $x^2 + y^2 + 10y = -9$

$5y$	25
x^2	$5y$

$x^2 + (y^2 + 10y + 25) = -9 + 25$

$x^2 + (y+5)^2 = 16$

$C(0,-5), \; r=4$

c. $x^2 + y^2 + 18x - 8y + 47 = 0$

$9x$	81
x^2	$9x$

$-4y$	16
y^2	$-4y$

$(x^2 + 18x + 81) + (y^2 - 8y + 16) = -47$ $+81$ $+16$

$(x+9)^2 + (y-4)^2 = 50$

$C(-9,4), \; r=\sqrt{50}$

d. $y^2 + (x-3)^2 = 1$

$C(3,0), \; r=1$

60. a. $2^x = 17$

$\log_2(17) = x$

b. $\log_3(x+1) = 5$

$3^5 = x+1$

$243 = x+1$

$x = 242$

c. $\log_3(3^x) = 4$

$3^4 = 3^x$

$x = 4$

d. $4^{\log_4(x)} = 7$

$\log_4(7) = \log_4(x)$

$x = 7$

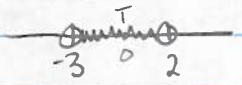
61. a. $|2x+1| < 5$

$|2x+1| = 5$

$2x+1 = -5$ or $2x+1 = 5$

$2x = -6$ $\quad$ $2x = 4$

$x = -3$ $\quad$ $x = 2$



$-3 < x < 2$

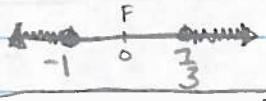
b. $2|3x-2| \geq 10$

$|3x-2| = 5$

$3x-2 = -5$ or $3x-2 = 5$

$3x = -3$ $\quad$ $3x = 7$

$x = -1$ $\quad$ $x = \frac{7}{3}$



$x \leq -1$ or $x \geq \frac{7}{3}$

62. Vertical shift up 2

$P = 2\pi$

cycles = 1

Amp = 4

Not flipped

$y = 4\sin(x) + 2$

Lesson 8.2.1 p. 392-393: 70-78

70. a. $-18-\sqrt{-25}$ → $-18-5i$

b. $\frac{2\pm\sqrt{-16}}{2}$ → $\frac{2\pm 4i}{2}$ → $1\pm 2i$

c. $5+\sqrt{-6}$ → $5+i\sqrt{6}$

71. $i^3=-i$ b/c $i^3=i^2\cdot i$ $=-1\cdot i$ $=-i$

$i^4=i^2\cdot i^2$ $=-1\cdot -1$ $=1$

72. $f(x)=x^2+7x-9$

a. $f(-3)=(-3)^2+7(-3)-9$ $=9-21-9$ $=-21$

b. $f(i)=i^2+7i-9$ $=-1+7i-9$ $=-10+7i$

c. $f(-3+i)=(-3+i)^2+7(-3+i)-9$

$9-6i+i^2-21+7i-9$

$-6i-1-21+7i$

$-22+i$

	i	-3
i	$-3i$	i^2
-3	9	$-3i$

-3 i

73. $x^2-10x=-29$ check $x=5+2i$

$(5+2i)^2-10(5+2i)=-29$

$25+20i+4i^2-50-20i=-29$

$25-4-50=-29$

$-29=-29$ ✓ yes

	$2i$	5
$2i$	$10i$	$4i^2$
5	25	$10i$

5 $2i$

74. $16^{(x+2)}=8^x$

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

$2^{4x+8}=2^{3x}$

$4x+8=3x$

$x=-8$

75. is $(x-5)^2$ equiv. to $(5-x)^2$?

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

x -5

$x^2-10x+25 \cong x^2-10x+25$

yes, these are equivalent

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

5 $-x$

76, a. $\sqrt{-49}$

$7i$

b. $\sqrt{-2}$

$i\sqrt{2}$

c. $(4i)^2$

$16i^2$

$16(-1)$

-16

d. $(3i)^3$

$27i^3$

$27i^2 \cdot i$

$27(-1) \cdot i$

$-27i$

77. a. $f(x) = 2x - 3$

x

$+2$

-3

$f^{-1}(x) = \frac{x+3}{2}$

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

x

-3

sq.

$+2$

$h^{-1}(x) = \sqrt{x-2} + 3$

78. a. $\frac{5.2(3.75)^x}{5.2} = \frac{100}{5.2}$

$3.75^x = \frac{100}{5.2}$

$\log_{3.75}\left(\frac{100}{5.2}\right) = x$

$\vdots$

$x = 2.24$

b. $4 + 3x^4 = 81$

$\frac{3x^4}{3} = \frac{77}{3}$

$\sqrt[4]{x^4} = \sqrt[4]{\frac{77}{3}}$

$\vdots$

$x = \pm 2.25$

Lesson 8.2.2 p. 396-399: 87-96 (omit 90)

87. a. $-3+i$ and $-3-i$

Sum: $-3+i+-3-i = -6$

Product: $9-i^2 = 9--1 = 10$

i	$-3i$	$-i^2$
-3	9	$3i$
	-3	$-i$

$y = x^2+6x+10$

Mariposa's method

b. $5+\sqrt{3}$ and $5-\sqrt{3}$

$(x-(5+\sqrt{3}))(x-(5-\sqrt{3}))$

$(x-5-\sqrt{3})(x-5+\sqrt{3})$

$-\sqrt{3}$	$-x\sqrt{3}$	$5\sqrt{3}$	-3
-5	$-5x$	25	$-5\sqrt{3}$
x	x^2	$-5x$	$x\sqrt{3}$
	x	-5	$\sqrt{3}$

$y = x^2-10x+22$

Austin's method

c. -2, $\sqrt{7}$ and $-\sqrt{7}$

$x=-2$, $x=\sqrt{7}$, $x=-\sqrt{7}$

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

$(x+2)(x^2-7)$

$-\sqrt{7}$	$-x\sqrt{7}$	-7
x	x^2	$x\sqrt{7}$
	x	$\sqrt{7}$

2	$2x^2$	-14
x	x^3	$-7x$
	x^2	-7

$y = x^3+2x^2-7x-14$

~~Melvin's method~~

d. 4, $-3+i$ and $-3-i$

$x=4$, $x=-3+i$, $x=-3-i$

$(x-4)(x+3-i)(x+3+i)$

$(x-4)(x^2+6x+9-i^2)$

$(x-4)(x^2+6x+10)$

$-i$	$-ix$	$-3i$	$-i^2$
3	$3x$	9	$3i$
x	x^2	$3x$	xi
	x	3	i

-4	$-4x^2$	$-24x$	-40
x	x^3	$6x^2$	$10x$
	x^2	$6x$	10

$y = x^3+2x^2-14x-40$

88. discriminant is b^2-4ac ← the stuff under $\sqrt{}$ in QF

a. $y = 2x^2+5x+4$

b^2-4ac

$25-4(2)(4)$

$25-32$

-7

Complex roots b/c $b^2-4ac < 0$

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

b^2-4ac

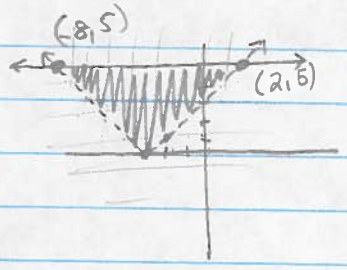
$25-4(2)(-3)$

$25+24$

49

Real roots b/c $b^2-4ac \geq 0$

89. $y > |x+3|$
$y \leq 5$



$A_\Delta = \frac{bh}{2} = \frac{10(5)}{2}$

$= \boxed{25 \text{ sq. units}}$

90. $i^0, i^1, i^2, i^3, i^4 \ldots i^{15}$

a. $i^0 = 1,\ i^1 = i,\ i^2 = -1,\ i^3 = -i,\ i^4 = 1,\ i^5 = i,\ i^6 = -1,\ i^7 = -i$

Repeats the pattern $1, i, -1, -i$

b. $i^{16} = (i^4)^4 = (1)^4 = \boxed{1}$

$i^{25} = (i^4)^6 \cdot i = 1 \cdot i = \boxed{i}$

$i^{39} = (i^4)^9 \cdot i^3 = 1 \cdot -i = \boxed{-i}$

$i^{100} = (i^4)^{25} = (1)^{25} = \boxed{1}$

c. $i^{4n} = (i^4)^n = 1^n = \boxed{1}$

d. $i^{4n+1} = \boxed{i}$, $i^{4n+2} = \boxed{-1}$, $i^{4n+3} = \boxed{-i}$

e. $i^{396} = (i^4)^{99} = \boxed{1}$, $i^{397} = \boxed{i}$, $i^{398} = \boxed{-1}$, $i^{399} = \boxed{-i}$

91. a. $i^{592} = (i^4)^{148} = \boxed{1}$ b. $i^{797} = (i^4)^{199} \cdot i = \boxed{i}$ c. $i^{10,648,202} = (i^4)^{2662050} \cdot i^2 = \boxed{-1}$

92. If n is a multiple of 4, the value is 1.
If n is 1 more than a multiple of 4, the value is i
If n is 2 more " -1
If n is 3 more " $-i$

93. a. $3^x = 17$

$\log_3 17 = x$

b. $\sqrt[3]{x^3} = \sqrt[3]{17}$

$x = \sqrt[3]{17}$

94. a. Graph 2

b. Graph 4

c. Graph 5

d. Graph 3

e. Graph 1

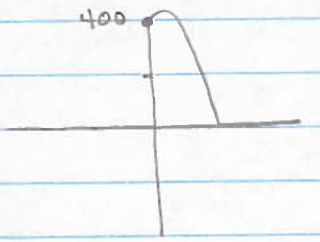
95. a. $h = -16t^2 + 16t + 400$

$h = -16(t^2 - t + .25) + 400 + 4$

$h = -16(t - .5)^2 + 404$

V(.5, 404) Graphing form

y-int = (0, 400) Standard form



b. Starting height = 400 ft

Max. height = 404 ft

96. a. logarithm

b. $x = 2$

c. $y = \log(x - 2)$

Lesson 8.2.3 p. 406: 106–112 Use with Quiz 8.1

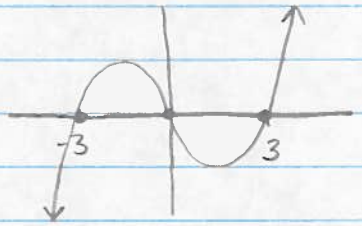
106. $y = x^3 - 9x$

a. $y = x(x^2 - 9)$

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

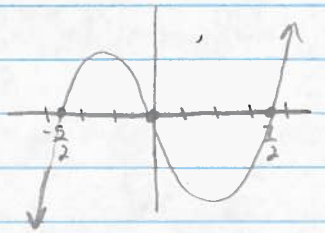
$0, -3, 3$

b.



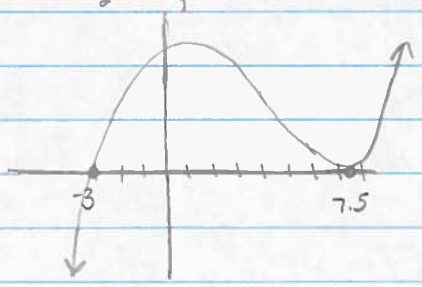
107. a. $y = x(2x+5)(2x-7)$

$0, -\frac{5}{2}, \frac{7}{2}$



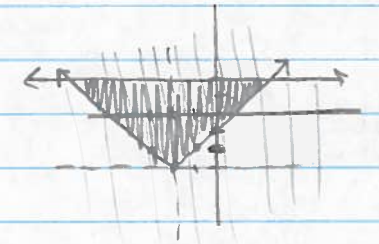
b. $y = (15-2x)^2(x+3)$

$\frac{15}{2}$, -3



108. $y \geq |x+2| - 3$

$y \leq 2$



109. $h = -4.9t^2 + 49t + 11.27$

a. Platform is 11.27 m high

Max. height = 133.77 m

Time to hit ground = 10.22 sec

$h = -4.9(t^2 - 10t + 25) + 11.27 + 122.5$

$h = -4.9(t-5)^2 + 133.77$

$V(5, 133.77)$

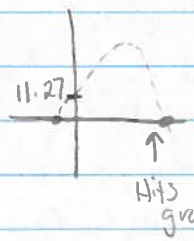
let $h = 0$, $0 = -4.9(t-5)^2 + 133.7$

$-133.7 = -4.9(t-5)^2$

$\sqrt{(t-5)^2} = \sqrt{27.3}$

$t - 5 = \pm 5.22$

$t = 10.22$ or $t = -.22$ (ignore b/c neg.)



110. $5x^2+bx+20=0$ Real solutions when $b^2-4ac \geq 0$

$b^2-4ac = b^2-4(5)(20) \geq 0$

$b^2 - 400 \geq 0$

$\sqrt{b^2} = \sqrt{400}$

$b^2 = \pm 20$

$b \leq -20$ or $b \geq 20$

$5x^2+20=0$

$5x^2=-20$

$x^2=-4$

imaginary

111. a. $(i-3)^2 = 8-6i$ b. $(2i-1)(3i+1) = -7-i$ c. $(3-2i)(3+2i) = 13$

-3	$-3i$	9
i	i^2	$-3i$

$i \quad -3$

i^2-6i+9

$-1-6i+9$

$8-6i$

-1	$-3i$	-1
$2i$	$6i^2$	$2i$

$3i \quad 1$

$6i^2 - i - 1$

$6(-1) - i - 1$

$-7-i$

$-2i$	~~$-6i$~~	$-4i^2$
3	9	~~$6i$~~

$3 \quad 2i$

$9 - 4i^2$

$9-4(-1)$

13

112. $y = \frac{1}{2}$

$y = \frac{16}{x^2-4}$

$\frac{1}{2} = \frac{16}{x^2-4}$

$32 = x^2-4$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

$(6, \frac{1}{2}), (-6, \frac{1}{2})$

Lesson 8.3.1 p. 411-413: 120-128 (omit 126, 128)

120. a. $x=-7$ b. $(-7)^3+5(-7)^2-16(-7)-14=0$?

$\vdots$

$0=0$ ✓

c. $(x+7)$

d.

	x^2	$-2x$	-2
x	x^3	$-2x^2$	$-2x$
7	$7x^2$	$-14x$	-14

$x^3 \quad 5x^2 \quad -16x \quad -14$

x^2-2x-2

e. $(x+7)(x^2-2x-2)=0$

f. $x^2-2x-2=0$

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

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

$=1\pm\sqrt{3}$

$-7,\ 1\pm\sqrt{3}$

121. $x=1$ means $(x-1)$ is a factor

	$2x^2$	$5x$	-3
x	$2x^3$	$5x^2$	$-3x$
-1	$-2x^2$	$-5x$	3

$2x^3 \quad 3x^2 \quad -8x \quad 3$

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

$x=\frac{-5\pm\sqrt{25-4(2)(-3)}}{2(2)}$

$=\frac{-5\pm\sqrt{49}}{4}=\frac{-5\pm 7}{4}=$

$\frac{-5+7}{4}=\frac{2}{4}=\frac{1}{2}$

$\frac{-5-7}{4}=\frac{-12}{4}=-3$

$1,\ \frac{1}{2},\ -3$

122. C b/c leading coeff. must be 1, so eliminate b & d
the constant term must be 30, so eliminate a.

123. **b** b/c 5 is a factor of the constant term.

124.

	x^2	$-4x$	-1
x	x^3	$-4x^2$	$-x$
-5	$-5x^2$	$20x$	5

$x^3 \quad -9x^2 \quad 19x \quad 5$

$x^2 - 4x - 1 = 0$

$x = \frac{4 \pm \sqrt{16 - 4(1)(-1)}}{2(1)} = \frac{4 \pm \sqrt{20}}{2} = \frac{4 \pm 2\sqrt{5}}{2}$

$2 \pm \sqrt{5}$

$5, 2 \pm \sqrt{5}$

125. $5x^2 - 7x - 6 = 0$

a.

-2	$-10x$	-6
x	$5x^2$	$3x$

$5x \quad 3$

$-30x^2$, $-10x$, $3x$, $-7x$

$(x-2)(5x+3)$

b. $x = 2, \; x = \frac{-3}{5}$

c. Set each factor equal to zero and solve to find the solutions

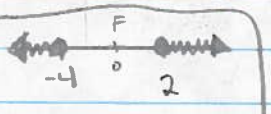
d. 2 & 3 are factors of 6
5 is a factor of the lead coeff.

127. a. $|x+1| \geq 3$

$|x+1| = 3$

$x+1 = 3 \quad x+1 = -3$

$x = 2 \quad x = -4$

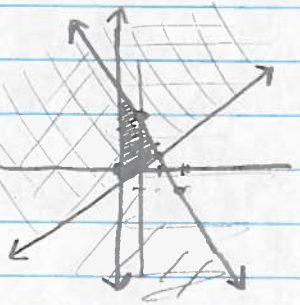


$x \leq -4$ or $x \geq 2$

b. $y \leq -2x + 3$

$y \geq x$

$x \geq -1$



Lesson 8.3.2 (day 1) p. 419-421 : 138-146 (omit 140, 141)

138. a. The graph shows that $x=3$ is a double root because the graph "bounces" off the x-axis at $x=3$.

b.

	x^3	$-x^2$	$-7x$	3
x	x^4	$-x^3$	$-7x^2$	$3x$
-3	$-3x^3$	$3x^2$	$21x$	-9

$x^4 \quad -4x^3 \quad -4x^2 \quad 24x \quad -9$

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

$x^3 \quad -x^2 \quad -7x \quad 3$

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

Roots: $3, -1\pm\sqrt{2}$

$x^2+2x-1=0$

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

$= \frac{-2\pm\sqrt{8}}{2}$

$= \frac{-2\pm 2\sqrt{2}}{2}$

$= -1\pm\sqrt{2}$

139. a. $(x-(3+4i))(x-(3-4i))$

$(x-3-4i)(x-3+4i)$

$-4i$	~~$-4xi$~~	~~$12i$~~	$-16i^2$
-3	$-3x$	9	~~$-12i$~~
x	x^2	$-3x$	~~$4xi$~~
	x	-3	$4i$

Eqn: $x^2-6x+9-16i^2=0$

$x^2-6x+9-16(-1)=0$

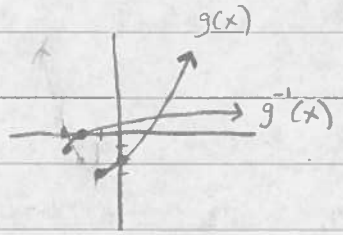
$x^2-6x+25=0$

b. $x=3+4i$ and $x=3-4i$

$(x-3-4i)(x-3+4i)=0$ > see the generic rectangle above to multiply & write the eqn.

C-I like Spud's method better b/c it's easier for me to get the factors so I can use a generic rectangle to multiply.

142. $g(x) = (x+1)^2 - 3$ $V(-1,-3)$, up



x
+1
sq.
-3

$g^{-1}(x) = \sqrt{x+3} - 1$

143. a. $y = x^3 + 1$ $x = -1 \Rightarrow (x+1)$

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

$x^3 \quad 0x^2 \quad 0x \quad 1$

$x^2 - x + 1 = 0$

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

$= \frac{1 \pm \sqrt{-3}}{2}$

$= \frac{1 \pm i\sqrt{3}}{2}$

Zeros: $-1, \frac{1 \pm i\sqrt{3}}{2}$

b. $y = x^{-3} - 8$ $x = 2 \Rightarrow (x-2)$

	x^2	$2x$	4
x	x^3	$2x^2$	$4x$
-2	$-2x^2$	$-4x$	-8

$x^3 \quad 0x^2 \quad 0x \quad -8$

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

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

$= \frac{-2 \pm \sqrt{-12}}{2}$

$= \frac{-2 \pm 2i\sqrt{3}}{2}$

$= -1 \pm i\sqrt{3}$

Zeros: $2, -1 \pm i\sqrt{3}$

144. $x = y + z$

$2x + 3y + z = 17$

$z + 2y = 7$

$x - y - z = 0$

$2x + 3y + z = 17$

$2y + z = 7$

$x - y - z = 0$

$2x + 3y + z = 17$

$3x + 2y = 17$

$-2x - 2y = -14$

$x = 3$

$x - y - z = 0$

$2y + z = 7$

$(x + y = 7) \cdot -2$

$3 + y = 7$

$y = 4$

$z + 2(4) = 7$

$z + 8 = 7$

$z = -1$

145. $\left(\sqrt{x^2+6}\right)^2 = (x+2)^2$

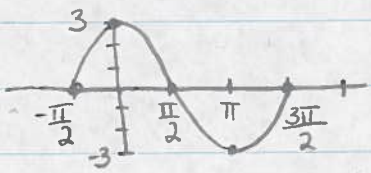
$x^2+6 = x^2+4x+4$

$2 = 4x$

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

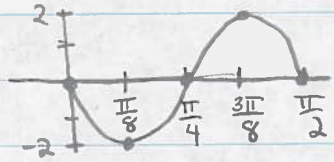
2	$2x$	4
x	x^2	$2x$
	x	2

146. a. $y = 3\sin\left(x+\frac{\pi}{2}\right)$ shift $\frac{\pi}{2}$ left, Amp = 3



b. $y = -2\sin(4x)$ Amp = 2

4 cycles by 2π, so $p = \frac{2\pi}{4} = \frac{\pi}{2}$



Lesson 8.3.2 (day 2) p. 421-423: 147-148, 151, 152a, 153c, 154-155

147. $x = -2+5i$, $x = -2-5i$, $x = -1$

$(x+2-5i)(x+2+5i)(x+1)$

$-5i$	~~$-5xi$~~	~~$-10i$~~	$-25i^2$
2	$2x$	4	~~$10i$~~
x	x^2	$2x$	~~$5xi$~~

x 2 $5i$

$x^2+4x+4-25i^2$

$x^2+4x+29$

1	x^2	$4x$	29
x	x^3	$4x^2$	$29x$

x^2 $4x$ 29

$x^3+5x^2+33x+29$

148. $P(x) = x^3-6x^2+7x+2$

a. $P(2) = 2^3-6(2)^2+7(2)+2 = 8-24+14+2 = \boxed{0}$

b. $x=2 \Rightarrow \boxed{(x-2)}$

c.

	x^2	$-4x$	-1
x	x^3	$-4x^2$	$-1x$
-2	$-2x^2$	$8x$	2

x^3 $-6x^2$ $7x$ 2

c. $\boxed{(x^2-4x-1)}$

d. $x^2-4x-1=0$

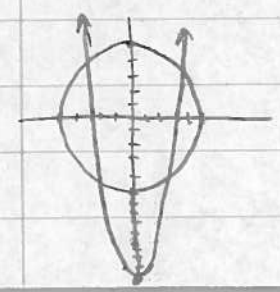
$x = \frac{4 \pm \sqrt{16-4(1)(-1)}}{2(1)}$

$= \frac{4 \pm \sqrt{20}}{2}$

$= \frac{2 \pm 2\sqrt{5}}{2} = 2 \pm \sqrt{5}$

$\boxed{2,\ 2 \pm \sqrt{5}}$

151. $x^2+y^2=25$ and $y = x^2-13$ (v(0,-13)) $\Rightarrow x^2 = y+13$



a. 4 pts.

6. $(\pm 3, -4)$ $(\pm 2, 3)$

13	$13y$	169
y	y^2	$13y$

y 13

$y+13+y^2=25$

$y^2+y-12=0$

y	y^2	$+12$
1	$3y$	$4y$

y 3

$-12y^2$ $3y$ $4y$ $1y$

$(y+4)(y-3)=0$

$y=-4$ $y=3$

$x^2 = -4+13$ $x^2 = 9+13$

$\sqrt{x^2} = \sqrt{9}$ $\sqrt{x^2} = \sqrt{4}$

$x = \pm 3$ $x = \pm 2$

152. a. $\sqrt{x} + 2 = x$

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

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

$0 = x^2 - 5x + 4$

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

-4	$-4x$	4
x	x^2	$-1x$
	y	-1

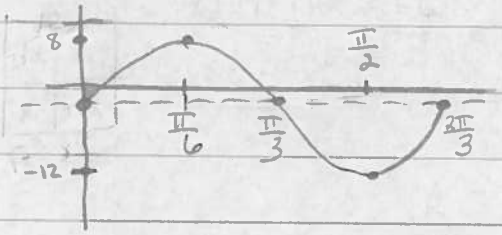
$4x^2$, $-1x$, $-4x$, $-5x$

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

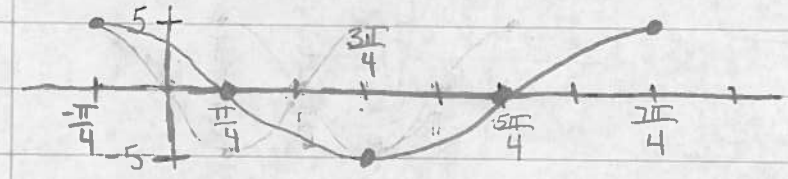
$\boxed{x=4}$ ~~$x=1$~~ ← Extraneous

153. b. $y = 10\sin(3x) - 2$ I only sketched 1 cycle!

$P = \frac{2\pi}{3}$



c. $y = 5\cos\left(x + \frac{\pi}{4}\right)$



154. $P(x) = x^3 + 4x^2 + x - 26$

a. $x = 2 \Rightarrow (x-2)$

	x^2	$6x$	13
x	x^3	$6x^2$	$13x$
-2	$-2x^2$	$-12x$	-26

x^3 $4x^2$ x -26

$\boxed{P(x) = (x-2)(x^2+6x+13)}$

b. $x^2 + 6x + 13 = 0$

$x = \frac{-6 \pm \sqrt{36 - 4(1)(13)}}{2(1)}$

$= \frac{-6 \pm \sqrt{-16}}{2}$

$= \frac{-6 \pm 4i}{2}$

$= -3 \pm 2i$

$\boxed{2, -3 \pm 2i}$

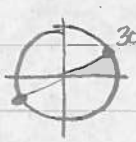
155. a. $\cos x = -\frac{1}{2}$

$x = 120°, 240°$

or

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$

b. $\tan x = \frac{\sqrt{3}}{3}$

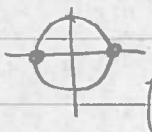


$x = 30°, 210°$

or

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

c. $\sin x = 0$

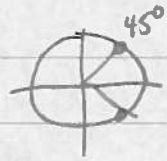


$x = 0°, 180°$

or

$x = 0, \pi$

d. $\cos x = \frac{\sqrt{2}}{2}$



$x = 45°, 315°$

or

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

Lesson 8.3.2 (day 3) p. 423-424: 157-164

157. $y = a(b)^x \Rightarrow 25000 = 15000(1.08)^x$

$\frac{5}{3} = 1.08^x$

$\log_{1.08}\left(\frac{5}{3}\right) = x$

$x = 6.64$ yrs

158. a. $\log_3(2x-1) = -2$

$3^{-2} = 2x-1$

$x = \frac{5}{9}$

b. $5^{\log_5 x} = 3$

$x = 3$

c. $\log_2(x) - \log_2(3) = 4$

$\log_2\left(\frac{x}{3}\right) = 4$

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

$\frac{16}{1} \times \frac{x}{3}$

$x = 48$

d. $\log_3(5) = x$

$x = 1.46$

159. $(3,2)$ $(3)^2 + (2)^3 = 17$

$9 + 8 = 17$

$17 = 17$ ✓

$(3)^4 - 4(2)^2 - 8(3)(2) = 17$

$81 - 16 - 48 = 17$

$17 = 17$ ✓

160. $x = 2$ or $x = 1.1187$ The x-values of the pts. of intersection are the solutions to the system.

161 a. $1234x + 23456 = 987654$

$1234x = 964198$

$x = 781.36$

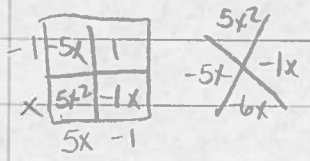
b. $\frac{10}{x} + \frac{20}{x} = 5$

$\frac{30}{x} \times \frac{5}{1}$

$5x = 30$

$x = 6$

161. c. $5x^2-6x+1=0$

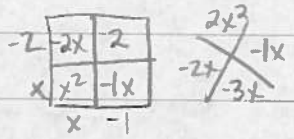


$(x-1)(5x-1)=0$

$\boxed{1, \frac{1}{5}}$

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

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



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

$\boxed{0, 2, 1}$

162. The cos graph is the same as the sin graph, just shifted right $\frac{\pi}{2}$ radians

163. a. $\sqrt{-7}\cdot\sqrt{-7}$

$i\sqrt{7}\cdot i\sqrt{7}$

$i^2(7)$

$-1(7)$

$\boxed{-7}$

b. she multiplied $\sqrt{-7}\cdot\sqrt{-7}$ to get $\sqrt{49}=7$

c. she must always simplify the sq. root of neg. #'s before she multiplies

d. $a, b \geq 0$ to use the property.

164. a. $60^\circ \cdot \frac{\pi}{180^\circ}$ $\boxed{\frac{\pi}{3}}$

b. $75^\circ \cdot \frac{\pi}{180^\circ}$ $\boxed{\frac{5\pi}{12}}$

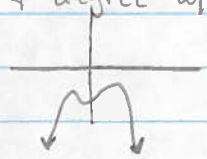
c. $210^\circ \cdot \frac{\pi}{180^\circ}$ $\boxed{\frac{7\pi}{6}}$

d. $225^\circ \cdot \frac{\pi}{180^\circ}$ $\boxed{\frac{5\pi}{4}}$

Lesson 8.3.3 p. 427-429: 169-176

169. $P(x) = x(x-3)^2(2x+1)$ x-intercepts: $(0,0)$ $(3,0)$ $(-\frac{1}{2}, 0)$

170. 4th degree w/ no roots



there is more than 1 answer... just make sure the graph doesn't cross the x-axis.

171. a. $x^2 - 10 = 0$

$\sqrt{x^2} = \sqrt{10}$

$x = \pm\sqrt{10}$

$(x+\sqrt{10})(x-\sqrt{10})$

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

$x = \frac{3 \pm \sqrt{9-4(1)(-7)}}{2(1)}$

$= \frac{3 \pm \sqrt{37}}{2}$

$\left(x - \frac{3+\sqrt{37}}{2}\right)\left(x - \frac{3-\sqrt{37}}{2}\right)$

c. $x^2 + 4 = 0$

$\sqrt{x^2} = \sqrt{-4}$

$x = \pm 2i$

$(x+2i)(x-2i)$

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

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

$= \frac{2 \pm \sqrt{-4}}{2}$

$= \frac{2 \pm 2i}{2}$

$= 1 \pm i$

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

172. a. $y = x^2 - 6$

let $d = b^2 - 4ac$

$b^2 - 4ac = 0^2 - 4(1)(-6)$

$= 24$

Real b/c $d \geq 0$

b. $y = x^2 + 6$

$d = 0^2 - 4(1)(6)$

$= -24$

Complex b/c $d < 0$

c. $y = x^2 - 2x + 10$

$d = 4 - 4(1)(10)$

$= 4 - 40 = -36$

Complex

→

172 d. $y = x^2 - 2x - 10$

$d = 4 - 4(1)(-10)$

$= 4 + 40 = 44$

Real

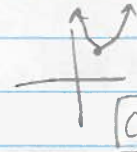
e. $y = (x-3)^2 - 4$

$V(3, -4)$ up

Real

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

$V(3, 4)$ up



Complex

173. $x^4 - 4x = 8x^2 - 40$ let $x = -2$

$(-2)^4 - 4(-2) = 8(-2)^2 - 40$

$16 + 8 \quad 32 - 40$

$24 \neq -8$

NO, $x = -2$ is not a solution

174. a. $2|x-3| + 7 = 11$

$2|x-3| = 4$

$|x-3| = 2$

$x - 3 = 2 \quad x - 3 = -2$

$x = 5$ or $x = 1$

b. $4(x-2)^2 = 16$

$\sqrt{(x-2)^2} = \sqrt{4}$

$x - 2 = \pm 2$

$x = 2 \pm 2$

$x = 4$ or $x = 0$

c. $\left(\sqrt{x+18}\right)^2 = (x-2)^2$

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

$0 = x^2 - 5x - 14$

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

-7	$-7x$	-14
x	x^2	$2x$
	x	2

$-14/2$, $-7x$, $2x$, $-5x$

$(x-7)(x+2) = 0$

$x = 7$ or $x = -2$

Extraneous

Check $x = 7$: $\sqrt{25} = 7 - 2$

$5 = 5$ ✓

Check $x = -2$: $\sqrt{16} = -2 - 2$

$4 \neq -4$

174 d. $|2x+5| = 3x+4$

$2x+5 = 3x+4$ or $2x+5 = -(3x+4)$

$1 = x$

$2x+5 = -3x-4$

$5x = -9$

$x = \frac{-9}{5}$ ← Extraneous

check $x=1$: $|2+5| = 3(1)+4$

$7 = 7$ ✓

check $x=-1.8$: $|-3.6+5| = 3(-1.8)+4$

$1.4 = -5.4+4$

$1.4 \neq -1.4$

175. $P(x) = x^3 - 3x^2 - 7x + 9$

a. $P(5) = (5)^3 - 3(5)^2 - 7(5) + 9$

$= 125 - 75 - 35 + 9$

$= 24$

b. Divide $\frac{x^3 - 3x^2 - 7x + 9}{x-5}$

	x^2	$2x$	3
x	x^3	$2x^2$	$3x$
-5	$-5x^2$	$-10x$	-15

$x^3 \quad -3x^2 \quad -7x \quad 9$

$x^2 + 2x + 3$ remainder $9 - -15 = 24$

176. a. $x = -i$, $x = i$

$y = (x+i)(x-i)$

i	ix	$-i^2$
x	x^2	$-ix$

$x \quad -1$

$x^2 - i^2$

$x^2 - (-1)$

$y = x^2 + 1$

b. $x = 1+\sqrt{2}$, $x = 1-\sqrt{2}$

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

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

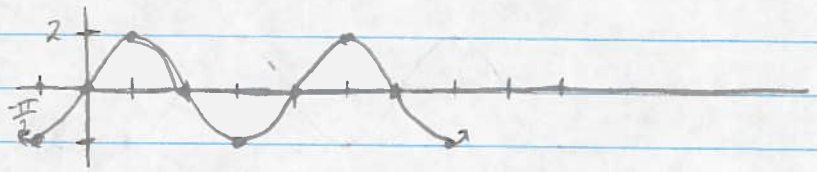
$-\sqrt{2}$	$-x+\sqrt{2}$	$\sqrt{2}$	-2
-1	$-x$	1	$-\sqrt{2}$
x	x^2	$-x$	$x\sqrt{2}$

$x \quad -1 \quad \sqrt{2}$

$y = x^2 - 2x + 1 - 2$

$y = x^2 - 2x - 1$

177 a. $y = -2\cos\left(x + \frac{\pi}{2}\right)$ shift left $\frac{\pi}{2}$ units



b. $y = \sin\left(x - \frac{\pi}{2}\right)$ shift right $\frac{\pi}{2}$

Chapter 8 Closure p. 433 - 435: 178 - 191 (omit 188b, 189)

178. a. $f(x) = 3x^3 - 2x + 5$ yes, degree = 3

b. $y = .25x^7 - 5x$ yes, degree = 7

c. $y = 3^x - x^2$ NO, x is an exponent

d. $f(x) = x^2 - \sqrt{x} + 2$ NO, $\sqrt{x}$ has an exponent that is a fraction

e. $Q(x) = 3(x-4)^2(x+2)$ Yes, Degree = 3

f. $y = x^2 - 3x + 5 - \frac{2}{x-2}$ NO, x is in the denominator

179. a. $f(x) = (x-2)^2 - 3$

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

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

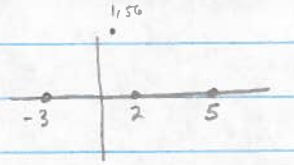
$x - 2 = \pm\sqrt{3}$

$x = 2 \pm \sqrt{3}$

b. $f(x) = (x-19)^2(x+14)$

$x = 19$ and $x = -14$

180. Thru (1, 56) w/ x-int: (-3, 0) (2, 0) (5, 0)



$P(x) = a(x+3)(x-2)(x-5)$

$56 = a(1+3)(1-2)(1-5)$

$56 = a(4)(-1)(-4)$

$56 = 16a$

$a = \frac{56}{16}$

$a = \frac{7}{2}$ or 3.5

$P(x) = 3.5(x+3)(x-2)(x-5)$

181. a. $y = 3x^2 + 5x + 4$

$b^2 - 4ac = (5)^2 - 4(3)(4)$

$= 25 - 48$

$= -23$

Complex

b. $y = 3x^2 + 5x - 4$

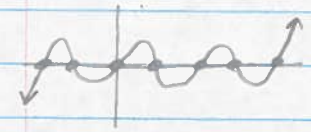
$b^2 - 4ac = (5)^2 - 4(3)(-4)$

$= 25 + 48$

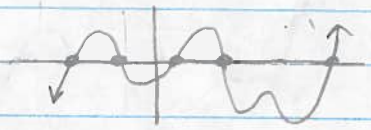
$= 73$

Real

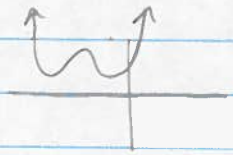
182. a. 7 real solutions



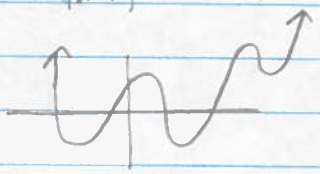
b. 5 Real, 2 complex



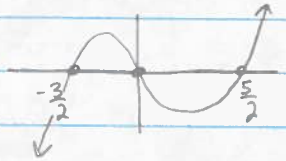
c. 4 complex



d. 2 complex, 4 real



183. a. $y = x(2x+3)(2x-5)$

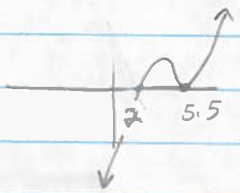


b. $y = (11-2x)^2(x-2)$

$11-2x=0$

$11=2x$

$x=5.5$



184. a. $(3+4i)+(7-2i)$

$10+2i$

b. $(3+5i)^2$

$5i$	$15i$	$25i^2$
3	9	$15i$
	3	$5i$

$9+30i+25i^2$

$9+30i+25(-1)$

$-16+30i$

c. $(7+i)(7-i)$

i	~~$7i$~~	$-i^2$
7	49	~~$-7i$~~
	7	$-i$

$49-i^2$

$49-(-1)$

50

d. $(3i)(2i)^2$

$3i \cdot 4i^2$

$3i \cdot 4(-1)$

$-12i$

e. i^3

$i^2 \cdot i$

$-1 \cdot i$

$-i$

f. i^{32}

$(i^4)^8$

1^8

1

185. $\frac{2x^3+x^2-19x+36}{x+4}$

	$2x^2$	$-7x$	9
x	$2x^3$	$-7x^2$	$9x$
4	$8x^2$	$-28x$	36
	$2x^3$	x^2	$-19x$	36

$2x^2-7x+9$

186. $f(x) = x^3 + 3x^2 + x - 5$ Graph shows $x = 1$ is a root

	x^2	$4x$	5
x	x^3	$4x^2$	$5x$
-1	$-1x^2$	$-4x$	-5

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

$1, -2 \pm i$

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

$x = \frac{-4 \pm \sqrt{16 - 4(1)(5)}}{2(1)}$

$= \frac{-4 \pm \sqrt{-4}}{2}$

$= \frac{-4 \pm 2i}{2} = -2 \pm i$

187. a. $x = 2i, \quad x = -2i$

$y = (x - 2i)(x + 2i)$

$-2i$	~~$-2xi$~~	$-4i^2$
x	x^2	~~$2xi$~~

$x \quad 2i$

$y = x^2 + 4$

b. $x = 2 + \sqrt{3}, \quad x = 2 - \sqrt{3}$

$y = (x - 2 - \sqrt{3})(x - 2 + \sqrt{3})$

$-\sqrt{3}$	~~$-x\sqrt{3}$~~	~~$2\sqrt{3}$~~	-3
-2	$-2x$	4	~~$-2\sqrt{3}$~~
x	x^2	$-2x$	~~$x\sqrt{3}$~~

$x \quad -2 \quad \sqrt{3}$

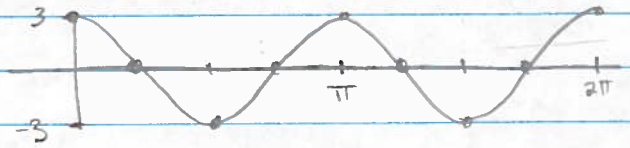
$y = x^2 - 4x + 1$

188. a. $y = 3\cos(2x)$

Amp $= 3$

$P = \frac{2\pi}{2} = \pi$

locater pt $= (0, 3)$



190. $y = 2x$

$y = x^2 + 5$

$y = 2(1 + 2i)$

$y = 2 + 4i$

$y = 2(1 - 2i)$

$y = 2 - 4i$

a. $x^2 + 5 = 2x$

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

$x = \frac{2 \pm \sqrt{4 - 4(1)(5)}}{2(1)}$

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

$x = \frac{2 \pm 4i}{2}$

$x = 1 \pm 2i$

$(1 + 2i, 2 + 4i)$

$(1 - 2i, 2 - 4i)$

b. The graphs don't intersect