8-62) $y = 4\sin x + 2$ shifted up 2 units and amplitude is 4

Thurs 4/9 8.2.1 (8-70 thru 8-78)

8-70) a) $-18 - \sqrt{25} = -18 - 5i$

b) $\frac{2 \pm \sqrt{-16}}{2} = \frac{2 \pm 4i}{2} = 1 \pm 2i$

c) $5 + \sqrt{-6} = 5 + i\sqrt{6}$

8-71) $i^3 = -i \Rightarrow i^3 = i^2 \cdot i = -1 \cdot i = -i$

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

8-72) $f(x) = x^2 + 7x - 9$

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

b) $f(i) = (i)^2 + 7i - 9 = -1 + 7i - 9 = \boxed{-10 + 7i}$

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

$9 - \cancel{3i} + \cancel{3i} + i^2 - 21 + 7i - 9$

$\cancel{9} - 1 - 21 + 7i - \cancel{9} = \boxed{-22 + 7i}$

8-73) $x^2 - 10x + 29 = 0$

$\frac{10 \pm \sqrt{100 - 4(1)(29)}}{2} = \frac{10 \pm \sqrt{100 - 116}}{2} = \frac{10 \pm \sqrt{-16}}{2}$

$\frac{10 \pm 4i}{2} = 5 \pm 2i$ yes it is a solution!

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

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

$\boxed{x = -8}$

8-75) $(x-5)^2 = x^2 - 10x + 25$ ✓

$(5-x)^2 = 25 - 5x - 5x + x^2 = x^2 - 10x + 25$

$(5-x)(5-x)$ Yes, equivalent

8-76) a) $\sqrt{-49} = 7i$ b) $\sqrt{-2} = i\sqrt{2}$

c) $(4i)^2 = 16 \cdot -1 = \boxed{-16}$

d) $(3i)^3 = 27 \cdot i^2 \cdot i = 27(-1)i = \boxed{-27i}$

8-77) a) $f(x) = 2x-3$

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

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

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

8-78) a) $\frac{5.2(3.75)^x}{5.2} = \frac{100}{5.2}$ $3.75^x = 19.23$

$x \log 3.75 = \log 19.23$

$x = \frac{\log 19.23}{\log 3.75} = \boxed{2.23}$

b) $4 + 3x^4 = 81$ $\sqrt[4]{x^4} = \sqrt[4]{\frac{77}{3}}$

$\frac{3x^4}{3} = \frac{77}{3}$ $\boxed{x = \pm 2.25}$

8.2.2 Monday 4/20 (8-87 → 8-96)

8-87) a) $f(x) = (x-(-3+i))(x-(-3-i))$

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

$x^2+3x-\cancel{ix}+3x+9-\cancel{3i}+\cancel{xi}+\cancel{3i}-i^2$

$x^2+6x+9-i^2$

$x^2+6x+9-(-1) = \boxed{x^2+6x+9+1}$

$f(x)=x^2+6x+10$

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

$x^2-5x+\cancel{x\sqrt{3}}-5x+25-\cancel{5\sqrt{3}}-\cancel{x\sqrt{3}}+5\sqrt{3}-\sqrt{9}$

$x^2-10x+25-3 = \boxed{x^2-10x+22}$

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

$x^3+\cancel{x^2\sqrt{7}}-\cancel{x^2\sqrt{7}}-x\sqrt{49}+2x^2+\cancel{2x\sqrt{7}}-\cancel{2x\sqrt{7}}-2\sqrt{49}$

$\boxed{x^3+2x^2-7x-14}$

d) $-3+i$ and $-3-i$ are conjugates

$-3+i-3-i=-6$ use $+6$ (the coefficient of x is the opposite of the sum)

$(-3+i)(-3-i) = 9+3i-3i-i^2 = 9-(-1)=10$

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

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

$\boxed{x^3+2x^2-14x-40}$

8-88) Discriminant $\sqrt{b^2-4ac}$

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

$\sqrt{(5)^2-4(2)(4)}$

$\sqrt{25-32}=\sqrt{-7}$

$\boxed{\text{Complex}}$

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

$\sqrt{5^2-4(2)(-3)}$

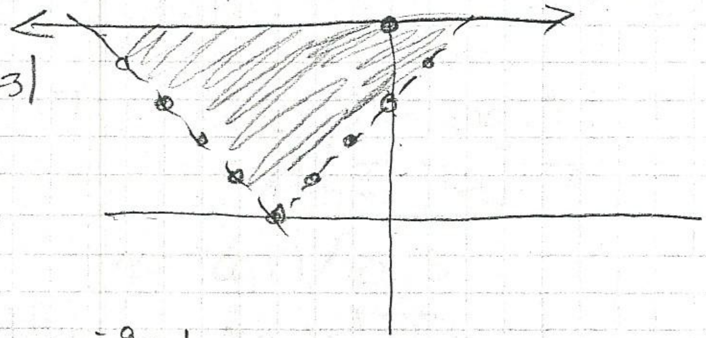
$\sqrt{25+24}$

$\sqrt{49}=7$

$\boxed{\text{Real}}$

8-89) $y > |x+3|$

$y \leq 5$



8-90) a) $i^0 = 1$

$i^1 = i$

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$

$i^5 = i$

$i^6 = -1$

$i^7 = -i$

$i^8 = 1$

$i^9 = i$

$i^{10} = -1$

$i^{11} = -i$

$i^{12} = 1$

$i^{13} = i$

$i^{14} = -1$

$i^{15} = -i$

Repeat

$1, i, -1, -i$ etc.

b) $i^{16} = 1$ $\quad i^{25} = i$ $\quad i^{39} = -i$ $\quad i^{100} = 1$

c) Since the exponent is even it will always be = to 1

d) $i^{4n+1} = i$ $\quad i^{4n+3} = -i$

$i^{4n+2} = -1$

e) $i^{396} = 1$ $\quad i^{397} = i$ $\quad i^{398} = -1$

$i^{399} = -i$

8-91) $i^{592} = 1$ even exponent $(592/2) = 296$

$i^{797} = i$

$i^{10,648,202}$ $\quad 10648202/2 = 5324101$ odd

$\boxed{\text{so } -1}$

8-92) If n is a multiple of 4 then the value is one because $\sqrt{4} = 2$ and is even. If it is 1 more than a multiple of 4 the value is i. If is 2 more than a multiple of 4 then it is -1. If it is 3 more than a multiple of 4 then it is $-i$.

$i^{4n} = 1$ $\quad i^{4n+2} = -1$

$i^{4n+1} = i$ $\quad i^{4n+3} = -i$

8-93) a) $3^x = 17$ $\quad \log 3^x = \log 17$

$x \log 3 = \log 17$

$x = \log 17 / \log 3$

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

8-94 a) shifted left $\pi/2$ 2

b) 4 2 cycles in 2π Period $= \pi$

c) amplitude is 2 and period is 4π 5

d) shifted down 3 3

e) flipped, period $= \pi$; shifted right $\frac{\pi}{8}$ 1

8-95) $h = -16t^2 + 16t + 400$

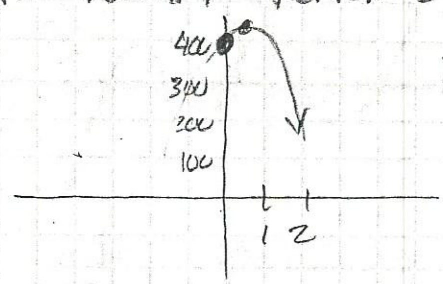
y int $= 400$ $\quad h = -16(t^2 - t) + 400$

(0, 400) $\quad h = -16(t^2 - t + \frac{1}{4}) + 400 + 4$

vertex $(\frac{1}{2}, 404)$ $\quad h = -16(t - \frac{1}{2})^2 + 404$

for y-int: Std Form

for vertex: Vertex or Graphing Form



b) started jump at 400 ft

max ht is 404 ft

8-96) a) $y = \log x$ (inverse of an exponential)

b) $x = 2$ (vert asymptote)

c) $y = \log_b(x-2)$ $\quad$ when $x = 6$ $y = 2$

$2 = \log_b(6-2)$ $\quad$ solve for b

$2 = \log_b 4$ $\quad b^2 = 4$

$b = 2$

so $\boxed{y = \log_2(x-2)}$

Tues/Wed 4/21 & 4/22 8.2.3 (8-104 ⇒ 8-112)

8-104) a) 3 real linear factors with one repeated @ $x=1$

So 2 real roots, one single and one double and no complex roots

b) 1 linear and 1 quadratic factor

The linear factor is one real root and the quadratic factor is non-real w/ 2 complex no real roots

c) 4 linear factors that are all real roots and no complex (non-real roots)

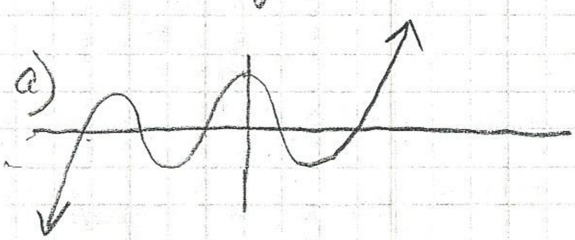
d) 2 linear and one quadratic factors

The linear are non real and 2 complex roots and the quadratic is real w/ 2 real roots for a total of 4 roots

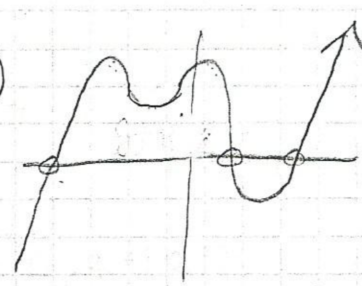
# of factors is the same as the number of times the graph switches directions.

8-105)

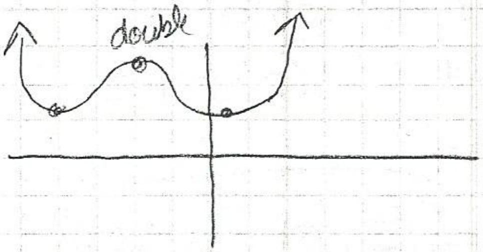
a)



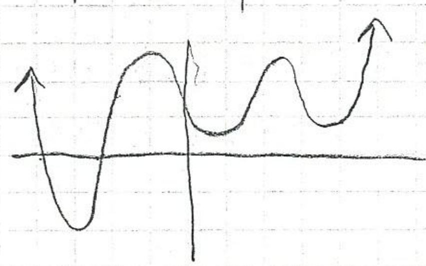
b)



c)



d)



e) a) 5 b) 5 c) 4 d) 6

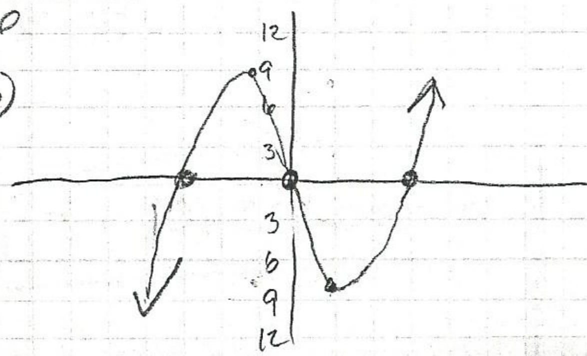
8-106) $y=x^3-9x$ a) roots

$(0,0)$
$(-3,0)$
$(3,0)$

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

x	y
1	-8
-1	8

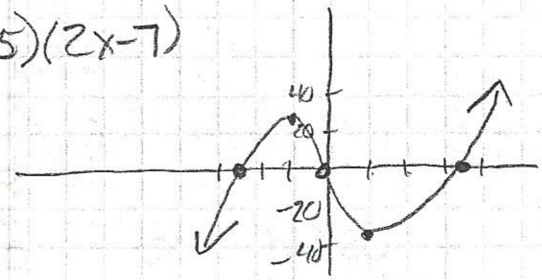
b)



8-107) a) $y = x(2x+5)(2x-7)$

$x=0$
$x=7/2$
$x=-5/2$

y-int $(0,0)$



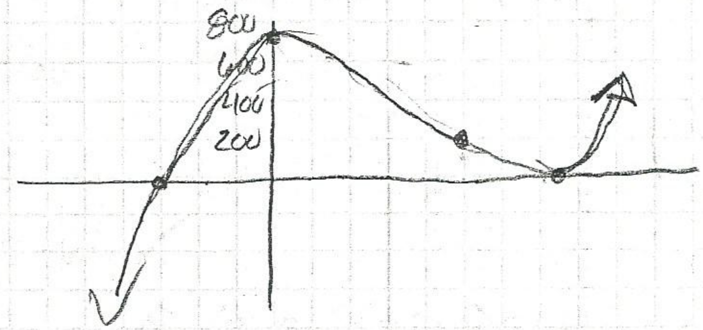
x	y
1	-35
-1	27

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

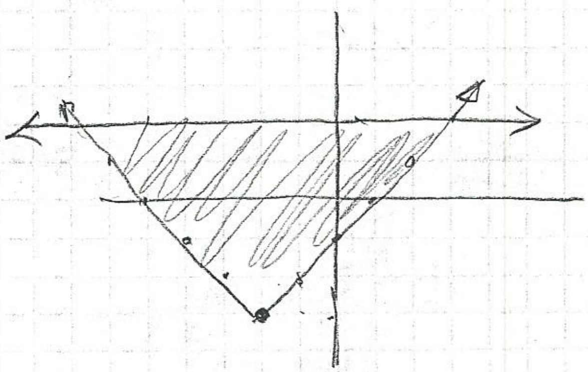
x	y
5	200
2	

$x=-3$
$x=7.5$ (double)

y-int $(0,775$



8-108) $y \geq |x+2|-3$ $\quad y \leq 2$



8-109) a) $h= -4.9t^2+49t+11.27$

height is y-int $=11.27$

max = vertex $\quad h=-4.9(t^2-10)+11.27$

$(5, 133.77)$ $\quad h=-4.9(t^2-10+25)+11.27+122.5$

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

$\boxed{\text{max ht} = 133.77}$

$0=-4.9(t-5)^2+133.77$

$\frac{-133.77}{-4.9} = \frac{-4.9(t-5)^2}{-4.9}$

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

$5.22 = t-5$

$\boxed{t = 10.22 \text{ seconds}}$

8-110) $5x^2+bx+20=0$

$b^2-4ac>0$

$b^2-4(5)(20)>0$

$b^2>400$

$b \geq \pm 20$ so $b \geq 20$

$b \leq -20$

8-111) a) $(i-3)^2 = 8-6i$

$(i-3)(i-3)$

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

$-1-6i+9$

$8-6i = 8-6i$ ✓

b) $(2i-1)(3i+1) = -7-i$

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

$6(-1)-i-1$

$-7-i = -7-i$ ✓

c) $(3-2i)(2i+3)=13$

$\cancel{6i}+9-4i^2-\cancel{6i}$

$9-4(-1)$

$9+4=13$ ✓

8-112) $y=\frac{1}{2}$ $y=\frac{16}{x^2-4}$

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

$\boxed{(\pm 6, \frac{1}{2})}$

$x^2-4=32$

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

$x=\pm 6$

Thurs 4/23 8.3.1 (8-120 → 8-128)

8-120) $x^3+5x^2-16x-14=0$

a) $x=-7$ (integer)

b) $(-7)^3+5(-7)^2-16(-7)-14=0$

$-343+245+112-14=0$

$0=0$ ✓

c) $(x+7)$

d)

$$
\begin{array}{r|l}
 & x^2-2x-2 \\
x+7 & x^3+5x^2-16x-14 \\
 & x^3+7x^2 \\
\hline
 & 0-2x^2-16x-14 \\
 & -2x^2-14x \\
\hline
 & 0-2x-14 \\
 & -2x-14 \\
\hline
 & 0
\end{array}
$$

$\boxed{x^2-2x-2}$

No remainder

8-120) cont'd e) $(x+7)(x^2-2x-2)=0$

f) $\frac{+2 \pm \sqrt{(-2)^2-4(1)(-2)}}{2} = \frac{2 \pm \sqrt{4+8}}{2} = \frac{2 \pm \sqrt{12}}{2} = \frac{2 \pm 2\sqrt{3}}{2}$

$= 1 \pm \sqrt{3}$ all the factors

$x=-7$
$x = 1+\sqrt{3}$
$x = 1-\sqrt{3}$

8-121) $(x-1)$ is a factor

$$\begin{array}{r} 2x^2+5x-3 \\ x-1 \overline{)\, 2x^3+3x^2-8x+3} \\ 2x^3-2x^2 \\ \hline 5x^2-8x \\ 5x^2-5x \\ \hline -3x+3 \\ -3x+3 \\ \hline 0 \end{array}$$

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

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

$(x-1)(2x^2+5x-3)$

$2x^2+5x-3$ AC $=-6$, $6 \cdot -1$

$2x^2+6x-1x-3$
$2x(x+3)-1(x+3)$
$(x+3)(2x-1)$

8-122) Part (c) because $x \cdot x \cdot x = x^3$ and $(-2)(3)(-5)=30$

8-123) (b) because 5 is a factor of the last term, not 2 or 3

8-124)

$$\begin{array}{r} x^2-4x-1 \\ x-5 \overline{)\, x^3-9x^2+19x+5} \\ x^3-5x^2 \\ \hline -4x^2+19x \\ -4x^2+20x \\ \hline -x+5 \\ -x+5 \\ \hline 0 \end{array}$$

x^2-4x-1

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

$\frac{4 \pm \sqrt{16+4}}{2} = \frac{4 \pm \sqrt{20}}{2}$

$\frac{4 \pm 2\sqrt{5}}{2} = 2 \pm \sqrt{5}$

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

8-125) $5x^2-7x-6=0$ $\qquad ac = -30$

$-10 \quad 3$

a) $5x^2-10x+3x-6=0$

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

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

b) $5x+3=0 \qquad x-2=0$

$\boxed{x=-3/5} \qquad \boxed{x=2}$

c) each factor solved represents a solution to the equation. They are the x-intercepts of the graph

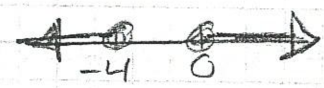
d) $(5x+3)(x-2)$ 3 and 2 are factors of the constant 6 and 5 is a factor of the leading coefficient

8-126) —Delete

8-127) a) $|x+1| \geq 3$

$x+1 \geq 1$ or $x+1 \leq -3$

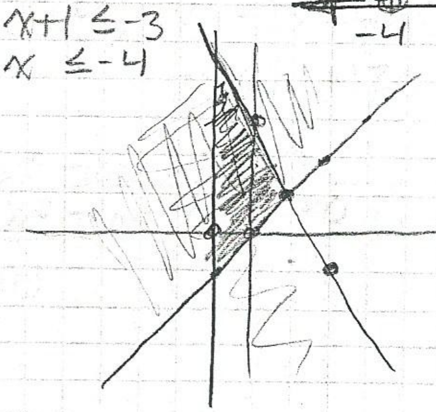
$x \geq 0 \qquad x \leq -4$



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

$y \geq x$

$x \geq -1$



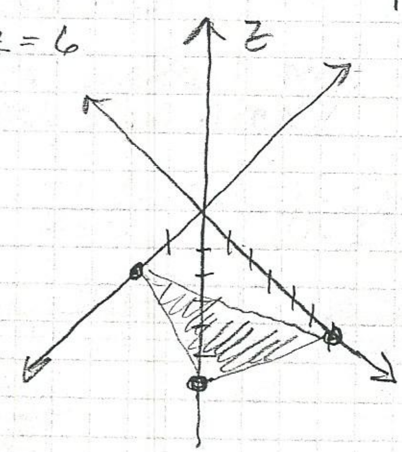
8-128) $3x+y-z=6$

$(2,0,0)$

$(0\ 6,0)$

$(0,0,-6)$

a)



b) $(1,2,-1)$

$3(1)+2-(-1) \stackrel{?}{=} 6$

$3+2+1 \stackrel{?}{=} 6$

$6=6$ ✓

Yes, a solution