Monday 4/27 8.3.2 (8-138 → 8-146)

8-138) $p(x) = x^4 - 4x^3 - 4x^2 + 24x + 9$

a) It shows that $(x-3)$ is a double factor and 3 is a double root

b)
$$\begin{array}{r|l} & x^2+2x-1 \\ x-3 & x^3-x^2-7x+3 \\ & \underline{x^2-3x^2} \\ & 2x^2-7x \\ & \underline{2x^2-6x} \\ & -1x+3 \\ & \underline{-1x+3} \\ & 0 \end{array}$$

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

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

$$\frac{-2 \pm \sqrt{4+4}}{2} = \frac{-2 \pm \sqrt{8}}{2}$$

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

$$\boxed{\begin{array}{l} \text{so } x = 3 \\ x = -1 + \sqrt{2} \\ x = -1 - \sqrt{2} \end{array}}$$

8-139) a) $(x-(3+4i))(x-(3-4i))$

$(x-3-4i)(x-3+4i) = x^2 - 3x + \cancel{4xi} - 3x + 9 - \cancel{12i}$
$\cancel{-4xi} + \cancel{12i} - 16i^2$

$x^2 - 6x + 9 - 16i^2$

$x^2 - 6x + 9 - 16(-1) = x^2 - 6x + 9 + 17$

$\boxed{x^2 - 6x + 25 = 0}$

b) $(x-3)(x-3) = (4i)(4i)$

$x^2 - 6x + 9 = 16i^2$

$x^2 - 6x + 9 = -16$

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

c) The second method has less steps and less chance for error

8-140 a) $\frac{3+2i}{-4+7i} \cdot \frac{-4-7i}{-4-7i} = \frac{-12 - 21i - 8i - 14i^2}{16 + \cancel{28i} - \cancel{28i} - 49i^2}$

$= \frac{-12 - 29i - 14(-1)}{16 - 49(-1)} = \frac{2-29i}{16+49} = \frac{2-29}{65}i$

b) $\frac{2}{65} - \frac{29i}{65}$

8-141) a) $\frac{2-5i}{1-2i} \cdot \frac{1+2i}{1+2i} = \frac{2+4i-5i-10i^2}{1-2i+2i-4i^2}$

$= \frac{2-i-10(-1)}{1-4(-1)} = \frac{12-i}{5} = \boxed{\frac{12}{5} - \frac{i}{5}}$

b) $\frac{(-3+i)}{(2+3i)} \cdot \frac{(2-3i)}{(2-3i)} = \frac{-6+9i+2i-3i^2}{4-6i+6i-9i^2} = \frac{-6+11i-3(-1)}{4-9(-1)}$

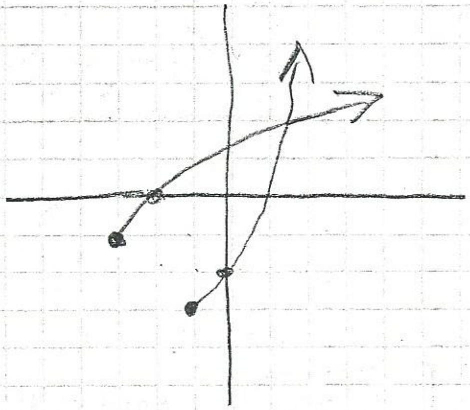
$\frac{-3+11i}{13} \quad \boxed{= \frac{-3}{13} + \frac{11i}{13}}$

8-142) $g(x) = (x+1)^2-3$

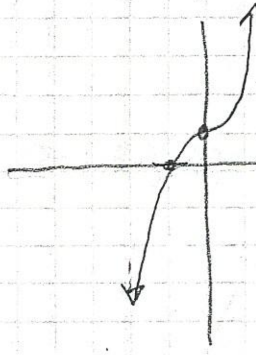
$g^{-1}(x) = \sqrt{x+3} - 1$

domain $x \geq -3$

range $y \geq -1$



8-143) a) $y = x^3+1$



$\sqrt[3]{-1} = \sqrt[3]{x^3}$

$x=-1$

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

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

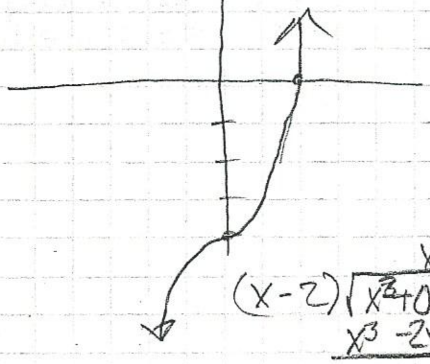
$\frac{+1 \pm \sqrt{(1)^2-4(1)(1)}}{2}$

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

$\boxed{\frac{1 \pm i\sqrt{3}}{2}} \boxed{\text{and } -1}$

b) $y = x^3-8$

one factor $(x=2)$



$$\begin{array}{r} x^2 + 2x + 4 \\ (x-2) \overline{)\, x^3 + 0x^2 + 0x - 8} \\ \underline{x^3 - 2x^2} \\ 2x^2 + 0x \\ \underline{2x^2 - 4x} \\ +4x - 8 \\ \underline{+4x - 8} \\ 0 \end{array}$$

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

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

$\frac{-2 \pm \sqrt{4-16}}{2}$

$\frac{-2 \pm \sqrt{-12}}{2} = \frac{-2 \pm 2i\sqrt{3}}{2}$

$\boxed{-1 \pm i\sqrt{3} \text{ and } x=2}$

8-144) $x = y + z$

① $2x + 3y + z = 17$
② $2y + z = 7$
③ $x - y - z = 0$

① ③ $2x + 3y + \cancel{z} = 17$
$x - y - \cancel{z} = 0$
$3x + 2y = 17$

② ③ $2y + \cancel{z} = 7$
$x - y - \cancel{z} = 0$
$-2(x + y = 7)$

$3x + 2y = 17$
$-2x - 2y = -14$
$x = 3$

$3 + y = 7$
$y = 4$

$\boxed{(3, 4, -1)}$

$3 - 4 - z = 0$
$-1 - z = 0$
$z = -1$

8-145) $\left(\sqrt{x^2+6}\right)^2 = (x+2)^2$

$x^2 + 6 = x^2 + 4x + 4$
$-x^2 \qquad -x^2$

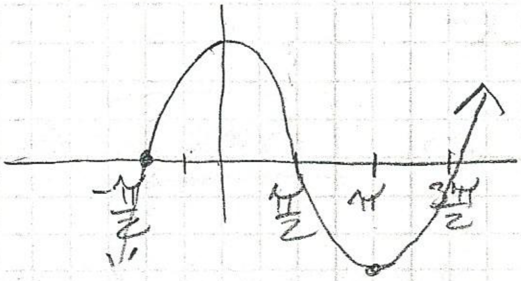
$\frac{6}{4} = 4x + 4$
-4

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

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

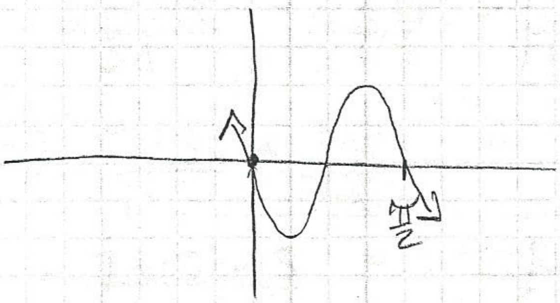
8-146) a) $y = 3\sin\left(x + \frac{\pi}{2}\right)$

shifted to left $\frac{\pi}{2}$
amplitude $= 3$



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

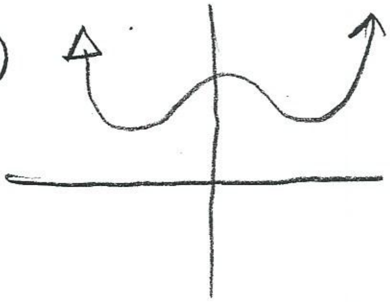
Period $= \frac{2\pi}{4} = \frac{\pi}{2}$
amplitude $= -2$
flipped!



Thurs 4/30 8.3.3 (8-169 → 8-177)

8-169) $P(x) = x(x-3)^2(2x+1)$ $(0,0)\ (3,0)\ (-\frac{1}{2},0)$

8-170)



8-171) a) $(x-\sqrt{10})(x+\sqrt{10})$ b) $\frac{3 \pm \sqrt{9-4(1)(-7}}{2} = \frac{3 \pm \sqrt{9+28}}{2}$

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

c) x^2+4

$\frac{0 \pm \sqrt{0^2-4(1)(4)}}{2} = \frac{\sqrt{-16}}{2} = \frac{\pm 4i}{2} = \pm 2i$

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

d) x^2-2x+2

$\frac{2 \pm \sqrt{4-4(1)(2}}{2} = \frac{2 \pm \sqrt{4-8}}{2} = \frac{2 \pm \sqrt{-4}}{2} = \frac{2 \pm 2i}{2}$

$1 \pm i$

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

8-172) a) $\sqrt{b^2-4ac} = \sqrt{-4(-6)(1)}$ ⊕ real

b) $\sqrt{0^2-4(6)(1)} = \sqrt{-24}$ complex

c) $\sqrt{4-4(10)(11)} = \sqrt{-40}$ complex

d) $\sqrt{4-4(1)(-10}$ positive/ real

e) $4 = (x-3)^2$ real

f) $-4 \neq (x-3)^2$ complex

$\sqrt{-4} = x-3$

8-173) $(-2)^4-4(-2)=8(-2)^2-40$

$16+8=32-40$

$24\neq -8$

Not a solution

8-174) a) $2|x-3|+7=11$ $\quad x-3=2$ $\quad x-3=-2$

$2|x-3|=4$ $\quad \boxed{x=5}$ $\quad \boxed{x=1}$

$|x-3|=2$

b) $4(x-2)^2=16$ $\quad \boxed{\begin{matrix}x=4\\x=0\end{matrix}}$

$(x-2)^2=4$

$x-2=\pm 2$

c) $(\sqrt{x+18})^2=(x-2)^2$ $\quad \boxed{\begin{matrix}x=+7\\x=-2\end{matrix}}$

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

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

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

d) $|2x+5|=3x+4$

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

$2x+5=-3x-4$ $\quad \boxed{1=x}$

$5x=-9$

$x=\cancel{-9/5}$ extraneous

8-175) $p(x)=x^3-3x^2-7x+9$

a) $p(5)=125-75-35+9$

$=24$

b)
$$\begin{array}{r}
x^2+2x+3\\
x-5\,\overline{)\,x^3-3x^2-7x+9}\\
\underline{x^3-5x^2}\\
2x^2-7x\\
\underline{2x^2-10x}\\
3x+9\\
\underline{3x-15}\\
24
\end{array}$$

x^2+2x+3

remainder $=24$

8-176) a) $(x-i)(x+i) = x^2 - xi + xi - i^2$

$\boxed{x^2+1}$

b.) $(x-(1+\sqrt{2})(x-(1-\sqrt{2})$

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

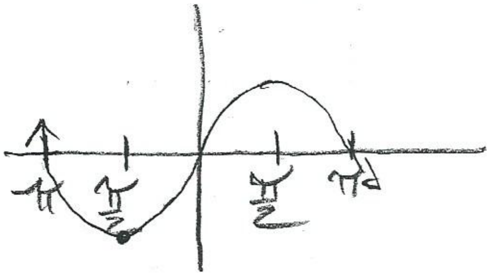
$x^2 - x + \cancel{x\sqrt{2}} + -x + 1 - \sqrt{2} - \cancel{\sqrt{2}x} + \sqrt{2} - \sqrt{4}$

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

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

8-177) a) $y = -2\cos(x+\frac{\pi}{2})$

shift $\frac{\pi}{2}$ left
amp. = 2
flip



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