Math 130 Homework #1 problems – Selected exercises

Handout Review Chapter 1

3d) $x^2+\sqrt{3}x-\frac{1}{4}=0$

$4x^2+4\sqrt{3}x-1=0$ quadratic equation in x

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-4\sqrt{3}\pm\sqrt{48+16}}{8}=\frac{-4\sqrt{3}\pm 8}{8}=\frac{\cancel{4}\left(-\sqrt{3}\pm 2\right)}{\cancel{8}_2}=\frac{-\sqrt{3}\pm 2}{2}$$

5b) $2x^7-128x=0$

Factor GCF : $2x\left(x^6-64\right)=0$

Difference of squares: $2x\left(x^3-8\right)\left(x^3+8\right)=0$

Difference/Sum of cubes: $2x\left(x-3\right)\left(x^2+2x+4\right)\left(x^2-2x+4\right)=0$

Zero Factor Property: $x=0$ or $x=3$ or $x=\frac{-2\pm\sqrt{4-16}}{2}=\frac{-2\pm 2\sqrt{3}i}{2}=\frac{2\left(-1\pm\sqrt{3}i\right)}{2}=-1\pm\sqrt{3}i$ or

$$x=\frac{2\pm\sqrt{4-16}}{2}=\frac{2\pm 2\sqrt{3}i}{2}=\frac{2\left(1\pm\sqrt{3}i\right)}{2}=1\pm\sqrt{3}i$$

9c) $7x^{-2}-10x^{-1}-8=0$

$\frac{7}{x^2}-\frac{10}{x}-8=0$, $x\neq 0$

Eliminate the denominators by multiplying both sides by x^2 : $7-10x-8x^2=0$

Write the equation in standard form with a positive leading coefficient: $8x^2+10x-7=0$

Quadratic formula (it can also be factored): $x=\frac{-10\pm\sqrt{324}}{16}=\frac{-10\pm 18}{16}$

$x=\frac{1}{2}$ or $x=-\frac{7}{4}$

11b) $\sqrt{x}-\sqrt{x-12}=2$

Isolate one of the radicals: $\sqrt{x-12}=\sqrt{x}-2$

$\left(\sqrt{x-12}\right)^2=\left(\sqrt{x}-2\right)^2$

$\cancel{x}-12=\cancel{x}-4\sqrt{x}+4$

$4\sqrt{x}=16$, so $\sqrt{x}=4$

$\left(\sqrt{x}\right)^2=16$, so $x=16$

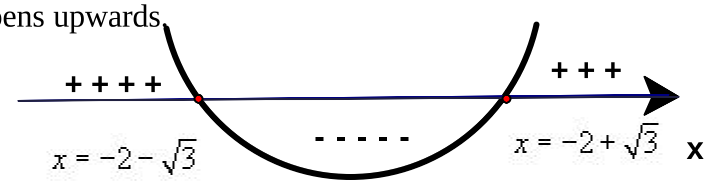
Check $x=16$ to see if it satisfies the equation (by raising an equation to the second power we don't necessarily obtain an equivalent equation).

$x=16$ satisfies the given equation , therefore it is a solution.

12d) $x^2+4x>-1$ This is a quadratic inequality!!!

Write it in standard form: $x^2+4x+1>0$

Note that $y=x^2+4x+1$ represents a parabola that opens upwards.



Find its x-intercepts by solving $x^2+4x+1=0$

$x=\dfrac{-4\pm\sqrt{12}}{2}=\dfrac{-4\pm2\sqrt{3}}{2}=-2\pm\sqrt{3}$

Therefore, $x^2+4x+1>0$ iff $x<-2-\sqrt{3}$ or $x>-2+\sqrt{3}$

12e) $x^3+4x^2-9x-36\geq 0$

Factor the left side: $x^2(x+4)-9(x+4)\geq 0$

$(x+4)(x^2-9)\geq 0$

$(x+4)(x-3)(x+3)\geq 0$

Study the sign of each factor:

x	$-\infty$ **-4** **-3** **3** ∞
$x+4$	- - - - - - 0 + + + + + + + + + + + + +
$x-3$	- - - - - - - - - - - - - - - - 0 + + + + +
$x+3$	- - - - - - - - - - 0 + + + + + + + + +
$(x+4)(x-3)(x+3)$	- - - - - - - 0 + + 0 - - - - 0 + + + + +

Therefore, $(x+4)(x-3)(x+3)\geq 0$ iff $x\in[-4,-3]\cup[3,\infty)$

12f) $(x-5)^2(x+1)<0$ iff $x+1<0$ (because $(x-5)^2\geq 0$ for any x) iff $x<1$.