MAT 121 WRITING PROJECT #1 FALL, 2019

(1) $x^2+8x-33=0$

$a=1, b=8, c=-33 \Rightarrow$

$b^2-4ac = 8^2-4(1)(-33)$

$= 64+132$

$= 196 = 14^2$

$\Rightarrow$ Factors by ac method

$\Rightarrow x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-8 \pm \sqrt{196}}{2(1)}$

$= \frac{-8 \pm 14}{2} = -4 \pm 7$ $\nearrow -4+7=3$ $\searrow -4-7=-11$

$\Rightarrow \boxed{x \in \{-11, 3\}}$

(2) $16.12x^2+5.85x-2.47=0$

$\Rightarrow 1612x^2+585x-247=0$

$\Rightarrow a=1612, b=585, c=-247$

$\Rightarrow b^2-4ac = 585^2-4(1612)(-247)$

$= 342225 + 1592656$

$= 1934881 = 1391^2$

$\Rightarrow$ factors "over the nationals," like #1!

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-585 \pm \sqrt{1934881}}{2(1612)}$

$= \frac{-585 \pm 1391}{3224}$ BONUS $\nearrow \frac{1}{4} = 0.25$ $\searrow -\frac{19}{31} \approx -.612903225\ldots$

$\boxed{x \in \{\frac{1}{4}, -\frac{19}{31}\}}$ is ALSO the bonus!

#2 $\boxed{x \in \{.2500, -.6129\}}$

BONUS

Scratch

2 | 1976	2 | 3224
2 | 988	2 | 1612
2 | 494	2 | 806
13 | 247	13 | 403
19	31

$\frac{1976}{3224} = \frac{2^3 \cdot 13 \cdot 19}{2^3 \cdot 13 \cdot 31}$

$= \frac{19}{31}$

(3) $6x^2+5x+3=0$

$\Rightarrow a=6, b=5, c=3$

$\Rightarrow b^2-4ac = 5^2-4(6)(3)$

$=25-72$

$=-47 \Rightarrow$ 2 nonreal solns.

$\Rightarrow x=\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-5\pm\sqrt{-47}}{2(6)}$

$= \frac{-5\pm i\sqrt{47}}{12}$ i.e.,

$$\boxed{x\in\left\{\frac{-5\pm i\sqrt{47}}{12}\right\}}$$

(4) $ax^2+2rx+7w=0$ (7 → 17)

$\Rightarrow a=a, b=2r, c=7w$ (7w → 17w)

$\Rightarrow b^2-4ac = (2r)^2-4(a)(7w)$

$= 4r^2-28aw$

$\Rightarrow x=\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-2r\pm\sqrt{4r^2-28aw}}{2a}$ (868)

$\frac{-2r\pm\sqrt{4(r^2-17aw)}}{2a} = \frac{-2r\pm 2\sqrt{r^2-17aw}}{2a}$

$= \frac{-r\pm\sqrt{r^2-17aw}}{a} = x$

$$\boxed{x\in\left\{\frac{-r\pm\sqrt{r^2-17aw}}{a}\right\}}$$

Nope

17w

$b^2-4ac = (2r)^2-4(a)(17w)$

$= 4r^2-4(17)(aw)$

$= 4(r^2-17aw)$

$x=\frac{-2r\pm\sqrt{4(r^2-17aw)}}{2a}$

$=\frac{-2r\pm 2\sqrt{r^2-17aw}}{2a}$

$=\frac{-r\pm\sqrt{r^2-17aw}}{a}$

(5) $x^2+8x-33$

$= x^2+11x-3x-33$

$= x(x+11)-3(x+11)$

$= (x+11)(x-3) = 0$

$\rightarrow \boxed{x \in \{-11, 3\}}$

(6) $33x^2+4x-12$

$= 33x^2+22x-18x-12$

$= 11x(3x+2)-6(3x+2)$

$= (3x+2)(11x-6) = 0$

$\rightarrow \boxed{x \in \{-\frac{2}{3}, \frac{6}{11}\}}$

(M3) Finish: Quadratic gave us answers, now write factored form:

$33(x-\frac{6}{11})(x+\frac{2}{3})$

Now fool the teacher:

$3(11)(x-\frac{6}{11})(x+\frac{2}{3})$

$= 11(x-\frac{6}{11})(3)(x+\frac{2}{3})$

$= (11x-6)(3x+2)$

cool!

(M1)

$-(12)(33)$

$= (-2)(2)(3)(3)(11)$

Want sum of +4:

$(-(2)(3)(3))((2)(11))$

$-18+22$ ✓

(M2)

Another way:

$4 = 4-0$

$= 5-1$

$= 18-14$

$= 20-16$

$= 21-17$

$= 22-18$

0

-5

-25^2

-32^0

-35^7

-396 ✓ sweet!

$-(12)(33)$ = magic = 396

M3: $a=33, b=4, c=-12$

$b^2-4ac = 4^2-4(33)(-12)$

$= 16+1584 = 1600 = 40^2$

$\rightarrow x = \frac{-4 \pm 40}{2(33)} = \frac{-2 \pm 20}{33}$

$\frac{18}{33} = \frac{6}{11}$

$-\frac{22}{33} = -\frac{2}{3}$

(7) $x^2+7x-33$

$= x^2+7x+\left(\frac{7}{2}\right)^2 - \frac{49}{4} - \left(\frac{33}{1}\right)\left(\frac{4}{4}\right)$

$= \left(x+\frac{7}{2}\right)^2 - \frac{181}{4} \stackrel{\text{SET}}{=} 0$

$\Rightarrow \left(x+\frac{7}{2}\right)^2 = \frac{181}{4}$

$\Rightarrow x+\frac{7}{2} = \pm\sqrt{\frac{181}{4}} = \pm\frac{\sqrt{181}}{2}$

$\Rightarrow x = \frac{-7\pm\sqrt{181}}{2} \Rightarrow \boxed{x \in \left\{\frac{-7\pm\sqrt{181}}{2}\right\}}$

Scratch:

$\frac{-49-132}{4}$

$= \frac{-181}{4}$

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(7) Done the way it's taught. I like the 1st way, above, because it's useful, later.

$x^2+7x-33=0$

$\Rightarrow x^2+7x = 33$

$\Rightarrow x^2+7x+\left(\frac{7}{2}\right)^2 = 33+\frac{49}{4} = \frac{132+49}{4} = \frac{181}{4}$

$\Rightarrow \left(x+\frac{7}{2}\right)^2 = \frac{181}{4}$

$\Rightarrow x+\frac{7}{2} = \pm\sqrt{\frac{181}{4}} = \pm\frac{\sqrt{181}}{2}$

$\Rightarrow x = \frac{-7\pm\sqrt{181}}{2} \Rightarrow \boxed{x \in \left\{\frac{-7\pm\sqrt{181}}{2}\right\}}$

121 WP #1

(8) $2x^2-4x-17=0$ METHOD 1

$\Rightarrow 2x^2-4x = 17$

$\Rightarrow 2(x^2-2x\ \ ) = 17$

$\Rightarrow 2(x^2-2x+1^2) = 17+2(1) = 19$

$\Rightarrow 2(x-1)^2 = 19$

$\Rightarrow (x-1)^2 = \frac{19}{2}$

$\Rightarrow x-1 = \pm\sqrt{\frac{19}{2}} = \pm\sqrt{\frac{19\cdot 2}{2\cdot 2}} = \pm\sqrt{\frac{38}{4}} = \pm\frac{\sqrt{38}}{2}$

$\Rightarrow \boxed{x \in \left\{1 \pm \frac{\sqrt{38}}{2}\right\}}$

(8) METHOD 2

$2x^2-4x-17=0$

$x^2-2x-\frac{17}{2}=0$

$x^2-2x = \frac{17}{2}$

$x^2-2x+1^2 = \frac{17}{2}+1 = \frac{17+2}{2} = \frac{19}{2}$

$(x-1)^2 = \frac{19}{2}$

$x-1 = \pm\sqrt{\frac{19}{2}} = \pm\sqrt{\frac{19}{2}}\sqrt{\frac{2}{2}} = \pm\frac{\sqrt{38}}{\sqrt{4}} = \pm\frac{\sqrt{38}}{2}$

$x = 1 \pm \frac{\sqrt{38}}{2} \longrightarrow \boxed{x \in \left\{1 \pm \frac{\sqrt{38}}{2}\right\}}$

(9) $3x^2+2x+7=0$

$3\left(x^2+\frac{2}{3}x\right)=-7$

$3\left(x^2+\frac{2}{3}x+\left(\frac{1}{3}\right)^2\right)=-7+3\left(\frac{1}{9}\right)=-\frac{21}{3}+\frac{1}{3}$

$3\left(x+\frac{1}{3}\right)^2=-\frac{20}{3}$

$\left(x+\frac{1}{3}\right)^2=-\frac{20}{9}$

$x+\frac{1}{3}=\pm\sqrt{-\frac{20}{9}}=\pm i\sqrt{\frac{4\cdot5}{3\cdot3}}=\pm i\frac{2\sqrt{5}}{3}$

$\Rightarrow \boxed{x\in\left\{\frac{-1\pm 2i\sqrt{5}}{3}\right\}}$

(10) $23x^2-4x+5=0$

$23\left(x^2-\frac{4}{23}\right)=-5$

$23\left(x^2-\frac{4}{23}+\left(\frac{2}{23}\right)^2\right)=-5+23\left(\frac{4}{23^2}\right)$

$=-5+\frac{4}{23}=\frac{-115+4}{23}=\frac{-111}{23}$

$\Rightarrow 23\left(x-\frac{2}{23}\right)^2=-\frac{111}{23}$

$\rightarrow \left(x-\frac{2}{23}\right)^2=-\frac{111}{23^2}$

$3\overline{)111}$
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$\Rightarrow x-\frac{2}{23}=\pm\sqrt{\frac{-111}{23^2}}=\pm i\frac{\sqrt{111}}{23}$

$\Rightarrow \boxed{x\in\frac{2\pm i\sqrt{111}}{23}}$