MAT 121 Writing Project #1 Fall, 2017

① $x^2 - 5x - 24 = 0 \longrightarrow a=1, b=-5, c=-24$

$\longrightarrow b^2-4ac = (-5)^2 - 4(1)(-24)$

$= 25 + 96$

$= 121$

$\frac{5+11}{2} = 8, \quad \frac{5-11}{2} = -3$

$\longrightarrow x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{5 \pm \sqrt{121}}{2(1)} = \boxed{\frac{5 \pm 11}{2} = x}$

$\boxed{x \in \{-3, 8\}}$

-3

② $7.27x^2 - 12.22x - 17.27 = 0$

$727x^2 - 1222x - 1727 = 0 \Longrightarrow a=727, b=-1222, c=-1727$

$\longrightarrow b^2-4ac = (-1222)^2 - 4(727)(-1727)$

$= 1493284 + 5022116$

$= 6515400 \quad \pm \sqrt{b^2-4ac} =$

Even uglier than planned!

$\sqrt{6515400} = 2.5\sqrt{6.10859}$

$= 10\sqrt{65154}$

$\begin{array}{r|l} 2 & 6515400 \\ 2 & 3257700 \\ 2 & 1628850 \\ 3 & 814425 \\ 5 & 271475 \\ 5 & 54295 \\ & 10859 \end{array}$

ugh!

$10859 \div 3$, PRIME!

So $x = \frac{1222 \pm 10\sqrt{65154}}{2(727)} = \frac{1222 \pm 10\sqrt{65154}}{1454}$

$= \boxed{\frac{611}{727} \pm \frac{5\sqrt{65154}}{727} = x}$

$\boxed{x \approx 2.0595961595, \; -.9150812645}$

MAT 121 WP1

(3) $49x^2 - 28x + 7 = 0$

$a = 49, b = -28, c = 7$

$b^2 - 4ac = (-28)^2 - 4(49)(7)$

$= 784 - 1372$

$= -588$

$\sqrt{-588} = 2 \cdot 7 i \sqrt{3} = 14 i \sqrt{3}$

So $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{28 \pm 14 i \sqrt{3}}{2(49)} = \boxed{\frac{2 \pm i\sqrt{3}}{7} = x}$

Cancel a factor of 14, top & bottom.

$2 \mid 588$
$2 \mid 294$
$3 \mid 147$
$7 \mid 49$
7

.285714285 7

$\pm .247435829\,7\, i$

(4) $ax^2 - 5rx - 6z = 0$

$a = a, b = -5r, c = -6z$

$b^2 - 4ac = (-5r)^2 - 4(a)(-6z)$

$= 25r^2 + 24az$

$$\boxed{x = \frac{5r \pm \sqrt{25r^2 + 24az}}{2a}}$$

MAT 121 WP #1

(5) $x^2-5x-24 = (x-8)(x+3) = 0$

$\Rightarrow \boxed{x \in \{-3, 8\}}$

	Diff	Prod
	$85 = 95-10$	-950
	$= 105-20$, sweet!	-2100

(6) $14x^2+85x-150 = 0$

$(14)(-150) = -2100$ Magic!

$14x^2+105x-20x-150$

$= 7x(2x+15) - 10(2x+15)$

$= (2x+15)(7x-10) = 0 \Rightarrow$

$\boxed{x \in \left\{+\frac{10}{7}, -\frac{15}{2}\right\}}$

(7) $x^2-5x-24 = 0$

$x^2-5x = 24$

$x^2-5x+\left(\frac{5}{2}\right)^2 = 24 + \frac{25}{4} = \frac{96+25}{4} = \frac{121}{4}$

$\left(x-\frac{5}{2}\right)^2 = \frac{121}{4}$

$x-\frac{5}{2} = \pm\sqrt{\frac{121}{4}} = \pm\frac{11}{2}$

$\boxed{x = \frac{5 \pm 11}{2}}$ $\quad \frac{16}{2} = 8$, $\quad -\frac{6}{2} = -3$ $\Rightarrow \boxed{x \in \{-3, 8\}}$

MAT 121 WP #1

(8) $x^2 - 8x - 17 = 0$

$x^2 - 8x = 17$

$x^2 - 8x + 4^2 = 17 + 16$ $\quad 3\overline{)33}$ $\quad 11$

$(x-4)^2 = 33$

$x - 4 = \pm\sqrt{33}$

$x = 4 \pm \sqrt{33}$ or, fancier, $x \in \{4 \pm \sqrt{33}\}$

(9) $3x^2 + 2x + 5 = 0$

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

$x^2 + \frac{2}{3}x = -\frac{5}{3}$

$x^2 + \frac{2}{3}x + \left(\frac{1}{3}\right)^2 = -\frac{5}{3} + \frac{1}{9} = \frac{-15+1}{9} = -\frac{14}{9}$

$\left(x + \frac{1}{3}\right)^2 = -\frac{14}{9}$

$x - \frac{1}{3} = \pm\sqrt{-\frac{14}{9}} = \pm i\,\frac{\sqrt{14}}{3}$

SOLN: $x = \frac{1}{3} \pm \frac{\sqrt{14}}{3}i$ OR SOLN SET: $x \in \left\{\frac{1}{3} \pm \frac{\sqrt{14}}{3}i\right\}$

I accepted either one

MAT 121 WP # 1

(10) $3x^2 - 4x - 1 = 0$

$x^2 - \frac{4}{3}x = \frac{1}{3}$

$x^2 - \frac{4}{3}x + \left(\frac{2}{3}\right)^2 = \frac{1}{3} + \frac{4}{9} = \frac{3}{9} + \frac{4}{9} = \frac{7}{9}$

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

$x - \frac{2}{3} = \pm\sqrt{\frac{7}{9}} = \pm\frac{\sqrt{7}}{3}$

$x \in \left\{\frac{2 \pm \sqrt{7}}{3}\right\}$