MAT 1340 Writing Project #1

Johnson

44/50

(m²) 1. $x^2 + 7x - 18 = 0$

$(x+9)(x-2) = 0$

$x \in \{-9, 2\}$

(m²) $x^2 + 7x - 18 = 0$

$a = 1 \quad b = 7 \quad c = -18$

$x = \frac{-(7) \pm \sqrt{(7)^2 - 4(1)(-18)}}{2(1)}$

Work out $b^2 - 4ac = 121$ first and seperately, then plug it straight in on this step.

$x = \frac{-7 \pm \sqrt{49 + 72}}{2}$

-2

$x = \frac{-7 \pm \sqrt{121}}{2}$

$x = \frac{-7 \pm 11}{2}$

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

$x = -\frac{18}{2}$

$x \in \{-9, 2\}$

-2

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2. $5.89x^2 - 13.09x + 7.26 = 0$

Multiply by 100 $589x^2 - 1309x + 726$

$a = 589 \quad b = -1309 \quad c = 726$

$b^2 - 4ac = -1309^2 - 4(589)(726)$

$= 1713481 - 1710456$

$= 3025 = 55^2$ show the step "$= \frac{-1309 \pm \sqrt{3025}}{1178}$"

$-b = -(-1309)$
$= +1309$

$x = \frac{+1309 \pm 55}{2(589)} = \frac{+1309 \pm 55}{1178}$ $-\frac{1}{2}$

$= \frac{1364}{1178}, \frac{1254}{1178}$ $-\frac{1}{2}$

A lot of times, calculators round to 8 digits which makes this "≈" too!

$x \in \{+1.15789474, +1.06451613\}$

$\approx \boxed{\{+1.1579, +1.0645\}}$

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3. $25x^2 - 20x + 7 = 0$

$a = 25 \quad b = -20 \quad c = 7$

$b^2 - 4ac = -20^2 - 4(25)(7)$

$= 400 - 700 = -300$

$x = \frac{-(-20) \pm \sqrt{-300}}{2(25)}$ Good!

$x = \frac{20 \pm \sqrt{-300}}{50}$

$x = \frac{20 \pm 10j\sqrt{3}}{50}$

$x = \frac{2 \pm j\sqrt{3}}{5}$

or $\boxed{x \in \left\{ \frac{2 \pm j\sqrt{3}}{5} \right\}}$ Nice!

-0

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4. $3mx^2 - 2wx + 5r$

$a = 3m \quad b = -2w \quad c = 5r$

$b^2 - 4ac = (-2w)^2 - 4(3m)(5r)$ ← leave out this 4 so you can see the factoring easier.

$= 4w^2 - 60mr$

↳ $4w^2 - 4(15mr)$

$= 4(w^2 - 15mr)$

$$x = \frac{2w \pm \sqrt{4w^2 - 60mr}}{6m}$$

$$\Rightarrow \frac{2w \pm 2\sqrt{w^2 - 15mr}}{3 \cancel{6} m} \quad -1$$

$$= \boxed{\frac{w \pm \sqrt{w^2 - 15mr}}{3m}}$$

5. $x^2 + 7x - 18 = 0$

$(x+9)(x-2) = 0$

$\boxed{x \in \{-9, 2\}}$

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6. $589x^2 - 1309x + 726 = 0$

$(589)(726) = 427614$

$-1309 = -745 - 564$ 420180 higher!

$= -600 - 709$ 425400 higher!

Insert miracle here

$= -682 - 627$ 427614 Perfect! ↖

$589x^2 - 682x - 627x + 726 = 0$ Nice "guess"

$= 31x(19x - 22) - 33x(19x - 22) \Rightarrow (31x - 33x)(19 - 22)$ -1

huh?!

$= (31x - 33)(19x - 22)$ -

$x \in \left\{\frac{33}{31}, \frac{22}{19}\right\}$ -

-1

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7. $x^2 + 7x - 18$

Complete square $x^2 + bx + \left(\frac{b}{2}\right)^2$

$x^2 + 7x = 18 \quad \left(\frac{7}{2}\right)^2 = \frac{49}{4}$

$x^2 + 7x + \frac{49}{4} = 18 + \frac{49}{4}$

$\left(x + \frac{7}{2}\right)^2 = \frac{121}{4}$

$x + \frac{7}{2} = \pm\sqrt{\frac{121}{4}}$

Make sure your radical is tall enough for the fraction.

$x + \frac{7}{2} = \pm\frac{11}{2}$

$x = -\frac{7}{2} \pm \frac{11}{2}$

$x = \frac{-7+11}{2}, \frac{-7-11}{2}$

$\boxed{x \in \{2, -9\}}$

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8. $x^2 - 24x - 9 = 0$

$x^2 - 24x = 9 \quad (-\frac{24}{2})^2 = 144$

$x^2 - 24x + 144 = 9 + 144$

$(x-12)^2 = 153$

$x - 12 = \pm\sqrt{153}$

$x = 12 \pm 3\sqrt{17}$

or $\boxed{x \in \{12 \pm 3\sqrt{17}\}}$

Nice!

-0

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9. $5x^2 + 2x + 3 = 0$

$$\frac{5}{5}x^2 + \frac{2}{5}x + \frac{3}{5} = 0$$

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

Complete square $\left(\frac{\frac{2}{5}}{2}\right)^2 = \frac{1}{25}$

$$x^2 + \frac{2}{5}x + \frac{1}{25} = -\frac{3}{5} + \frac{1}{25}$$

$$\left(x + \frac{1}{5}\right)^2 = -\frac{14}{25}$$

$$x + \frac{1}{5} = \pm\sqrt{-\frac{14}{25}}$$

$$x = -\frac{1}{5} \pm \frac{i\sqrt{14}}{5}$$

$$\boxed{x \in \left\{\frac{-1 \pm i\sqrt{14}}{5}\right\}}$$

Good!

-0

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10. $4x^2 - 16x + 11 = 0$

$$\frac{4}{4}x^2 - \frac{16}{4}x + \frac{11}{4} = 0$$

$$x^2 - 4x = -\frac{11}{4}$$

Complete square $(\frac{-4}{2})^2 = 4$

$$x^2 - 4x + 4 = -\frac{11}{4} + 4$$

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

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

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

or $\boxed{x \in \left\{\frac{2 \pm \sqrt{5}}{2}\right\}}$

Perfect!

-0