

40.5
50

Writing Project #1

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

a=1 b=7 c=-18 so using the quadratic formula of

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

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

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

... And plug it in here -1
Find this first...

Discriminant is: $b^2-4ac > 0$ so $7^2-4*1*(-18) = 49+72 = 121$

Then simplify to find the solutions:

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

$$x = \frac{4}{2} \quad x = -\frac{18}{2}$$

4/2 can be simplified to 2 so $x_1=2$ and $-18/2$ is simplified to -9 so $x_2=-9$

Solutions: $x_1=2, x_2=-9$ (real solutions)

style note A family of solutions is normally written as a set.
ie: $x = -9, 2$
from small \rightarrow large -1

MAT 1340

2. $5.89x^2 - 13.09x + 7.26 = 0$ (round 4 decimals)

Convert to fractions: $5.89 * 100 = 589/100x^2$, $-13.09 * 100 = -1309/100x$, $7.26 * 50 = 363/50$

Rewrite Equation: $589/100x^2 - 1309/100x + 363/50 = 0$

Multiply both sides by 100: $100 * 589/100x^2 - 1309/100x + 363/50 = 0 * 100 =$
 $589x^2 - 1309x + 726 = 0$

Use quadratic formula to solve: $a = 589$ $b = -1309$ $c = 726$

plug into equation:

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\x &= \frac{-(-1309) \pm \sqrt{(-1309)^2 - 4(589)(726)}}{2(589)} \\x &= \frac{1309 \pm \sqrt{1713481 - 1710456}}{1178} \\x &= \frac{1309 \pm \sqrt{3025}}{1178}\end{aligned}$$

The Discriminant is: $b^2 - 4ac$ so simplify back to decimals $a = 5.89$ $b = -13.09$ and $c = 7.26$
and plug into equation: $(-13.09)^2 - 4 * 5.89 * 7.26 = 171.348 - 171.046 = 0.3025$

Simplify and find Solutions using quadratic equation:

$$x = \frac{1309 \pm \sqrt{3025}}{1178} \quad \text{is equal to} \quad x = \frac{1309 \pm 55}{1178}$$

*Do this
and jump
straight
to this.*

MAT 1340

solved for + and -: $x = \frac{1364}{1178} \quad x = \frac{1254}{1178} \leftarrow \text{exact}$

Simplify: $\frac{1364}{1178} \approx 1.1579 \quad \frac{1254}{1178} \approx 1.0645 \leftarrow \text{rounded, not exact}$

So: $x_1 \approx 1.1579$ and $x_2 \approx 1.0645$ (real solutions)

Style
... as a set: $x \approx 1.1579, 1.0645$

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

Solve using quadratic formula: $a = 25, b = -20, c = 7$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-20) \pm \sqrt{(-20)^2 - 4(25)(7)}}{2(25)}$$

$$x = \frac{20 \pm \sqrt{400 - 700}}{50}$$

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

Find the discriminant: $b^2 - 4ac$ so $(-20)^2 - 4 \cdot 25 \cdot 7 = 400 - 700 = -300$

Simplify w/ formula:

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

can be simplified to

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

simplify radical to:

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

and stop there 😊

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

can be simplified further to

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

Solve: $x_1 = \frac{2}{5} + \frac{\sqrt{3}i}{5}$

~~$x_2 = \frac{2}{5} - \frac{\sqrt{3}i}{5}$ (non-real solutions)~~

MAT 1340

4. $3mx^2 - 2wx + 5r = 0$

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

Plug into formula: $(-2w)^2 - 4(3m)(5r) = 4w^2 - 60mr$ ~~$-4(3m)(5r)$~~ $= 4(w^2 - 15mr)$... and factor the 4.

Put into formula:

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

... then

$$\frac{2w \pm \sqrt{4(w^2 - 15mr)}}{6m}$$
$$= \frac{2w \pm 2\sqrt{w^2 - 15mr}}{3 \cdot 2m}$$
$$x = \frac{w \pm \sqrt{w^2 - 15mr}}{3m}$$

-2

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

Rewrite: $x^2 + 9x - 2x - 18 = 0$

Factor out x : $x(x+9) - 2x - 18 = 0$ then factor out -2 : $x(x+9) - 2(x+9) = 0$

Factor out $x+9$: $(x+9)(x-2) = 0$ set equal to 0: $x+9=0$ so $x=-9$ because $-9+9=0$ and $x-2=0$ so $x=2$ because $2-2=0$

Solutions: $x_1 = -9$, $x_2 = 2$

-2

MAT 1340

ONE-TASK

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

*where did these numbers come from?
Need either guesses or quadratic to prove it.*

Rewrite: $-1309x$ is equal to $-627x - 682x$ therefore: $589x^2 - 627x - 682x + 726 = 0$

$589x^2 - 627x$ is equal to $19x(31x - 33)$ so factor out $19x$: $19x(31x - 33) - 682x + 726 = 0$

Factor out $-22(31x - 33)$ for $-682x + 726$ so: $19x(31x - 33) - 22(31x - 33) = 0$

Then factor out $31x - 33$ from the expression: $(31x - 33)(19x - 22) = 0$

-2

Set both equal to 0: $31x - 33 = 0$ and $19x - 22 = 0$

Solve for x : $31x - 33 = 0$ add 33 to both sides and divide by 31: $31x/31 - 33/31 + 33 = 33/31$
simplify: $x = 33/31$

Solve for x : $19x - 22 = 0$ add 22 to both sides and divide by 19: $19x/19 - 22/19 + 22 = 22/19$ so
 $x = 22/19$

Solutions: $x_1 = 33/31$ and $x_2 = 22/19$

-2

MAT 1340

MAT 1340

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

Move the constant by adding 18 to both sides: $x^2+7x-18+18=18$ so $x^2+7x=18$

← because it's $(\frac{b}{a})^2$

Add common factor of $49/4$ to both sides: $x^2 + 7x + 49/4 = 18 + 49/4$

Use equation $a^2+2ab+b^2$ to factor: $(x+7/2)^2=18+49/4$ find sum: $(x+7/2)^2=121/4$

Solve equation for x: remove exponent by dividing: $x+7/2=\sqrt{121/4}$ so $x+7/2=11/2$

Move constant so $x=11/2-7/2=2$

Then solve for: $x+7/2=-\sqrt{121/4}$ so $x+7/2=-11/2$ subtract $-7/2$ from both sides: $x=-11/2-7/2=-9$

Solutions: $x_1=2$ and $x_2=-9$

MAT 1340

ONE-TAM

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

Add 9 to both sides: $x^2 - 24x - 9 + 9 = 0 + 9 = x^2 - 24x = 9$

Take square of 24=144 and add to both sides: $x^2 - 24x + 144 = 9 + 144$

Factor 12: $(x - 12)^2 = 153$

Take square root of both sides and add 12 to both sides: $x = 12 \pm \sqrt{153}$

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

Stop here :)

Solutions: $x_1 = 12 + 3\sqrt{17}$ $x_2 = 12 - 3\sqrt{17}$

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

Move constant to the right side: $5x^2 + 2x + 3 - 3 = 0 - 3$ so $5x^2 + 2x = -3$

Divide by 5: $5x^2/5 + 2x/5 = -3/5$ so $x^2 + 2/5 x = -3/5$

Add to both sides: $x^2 + 2/5 x + 1/25 = -3/5 + 1/25$

Use $a^2 + 2ab + b^2 = (a + b)^2$ to factor: $(x + 1/5)^2 = -3/5 + 1/25$ calculate: $(x + 1/5)^2 = -14/25$

Solve: $(x + 1/5)^2 = -14/25$

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

$= \pm \frac{\sqrt{14}}{5}$

~~No equal factors, therefore, no real solutions~~

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

Use the LCD to combine into one big fraction.

-2

-2

MAT 1340

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

Move the constant: $4x^2 - 16x + 11 - 11 = 0 - 11 = 4x^2 - 16x = -11$

Divide both sides by 4: $4x^2/4 - 16x/4 = -11/4 = x^2 - 4x = -11/4$

Add the common factor to both sides: $x^2 - 4x + 4 = -11/4 + 4$

Factor 2 from the expression and use the equation: $(x-2)^2 = -11/4 + 4 = (x-2)^2 = 5/4$

Solve for x by adding 2 to both sides and take the square root of both sides: $x = -\sqrt{5/2} + 2$
and $x = \sqrt{5/2} + 2$

~~Cannot be simplified any further so the solutions are: $x_1 = -\sqrt{5/2} + 2$ and $x_2 = \sqrt{5/2} + 2$~~

↳ Can write as one "x" statement

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