

MAT 121 Writing Project #1
Fall, 2021

①

Quadratic Formula

① $x^2 + 5x - 36 = 0 \Rightarrow a = 1, b = 5, c = -36$

$$\Rightarrow b^2 - 4ac = 5^2 - 4(1)(-36)$$

$$= 25 + 144$$

$$= 169$$

$$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{169}}{2(1)} = \frac{-5 \pm 13}{2}$$

$$= \begin{cases} -5 + 13 = 8 \\ -5 - 13 = -18 \end{cases} \Rightarrow x \in \{-18, 8\}$$

② $3.73x^2 + 11.11x - 21.73 = 0 \Rightarrow$

$$a = 3.73, b = 11.11, c = -21.73$$

$$\Rightarrow b^2 - 4ac = 11.11^2 - 4(3.73)(-21.73)$$

$$= 123.4321 + 324.2116$$

$$= 447.6437 \Rightarrow$$

$$x = \frac{-11.11 \pm \sqrt{447.6437}}{2(3.73)} \approx \frac{-11.11 \pm 21.15759202}{7.46}$$

$$\approx \begin{cases} -11.11 + \dots \approx 1.346862201 \\ -11.11 - \dots \approx -4.32541448 \end{cases} \Rightarrow$$

$$x \in \{1.3469, -4.3254\}$$

(2B)

$$3.73x^2 + 11.11x - 21.73 = 0 \rightarrow$$

$$373x^2 + 1111x - 2173 = 0 \rightarrow$$

$$a = 373, b = 1111, c = -2173 \rightarrow$$

$$b^2 - 4ac = 1111^2 - 4(373)(-2173)$$

$$= 1234321 + 3242116 = 4476437$$

Scratch: Will 4476437 simplify at all?

$$\begin{array}{r} 7 \overline{) 4476437} \\ \underline{639491} \end{array}$$

It turns out that 639491 is prime!

I don't know how you'd discover that without a lookup or technology hammer!

I pulled out one factor of 7 & gave up @ around 29 or 31. So

$4476437 = (7)(639491)$ & it factors no further. Therefore,

$$x = \frac{-1111 \pm \sqrt{4476437}}{746} \text{ is as simple as}$$

we can make an exact answer!

$$(3) \quad 25x^2 - 30x + 16 = 0 \Rightarrow a = 25, b = -30, c = 16$$

$$\Rightarrow b^2 - 4ac = (-30)^2 - 4(25)(16) = 900 - 1600$$

Scratch:

$$= -700 \Rightarrow$$

$$x = \frac{30 \pm 10\sqrt{-7}}{2(25)}$$

$$\begin{array}{r} 10 \overline{) 700} \\ 10 \overline{) 70} \\ 7 \end{array}$$

$$= \frac{30 \pm 10i\sqrt{7}}{50} = \frac{10(3 \pm i\sqrt{7})}{50}$$

$$= \boxed{\frac{3 \pm i\sqrt{7}}{5}}$$

$$(4) \quad bx^2 + \pi x - 11w = 0 \Rightarrow a = b, b = \pi, c = -11w$$

$$\Rightarrow b^2 - 4ac = \pi^2 - 4(b)(-11w)$$

$$= \pi^2 + 44bw \Rightarrow$$

$$x = \boxed{\frac{-\pi \pm \sqrt{\pi^2 + 44bw}}{2b}}$$

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WP #1
 FACTORING

(4)

(5)

$$x^2 + 5x - 36 = 0 \rightarrow$$

$$(x+9)(x-4) = 0 \rightarrow$$

$$x \in \{-9, 4\}$$

(6)

$$18x^2 - 27x - 110 = 0$$

$$18(-110) = -1980 = 2c$$

$$-27 = -28 + 1$$

$$= -37 + 10$$

$$= -50 + 23$$

$$= -55 + 28$$

$$= -60 + 33$$

$$-28$$

$$-370$$

$$-1150$$

$$-1548$$

$$-1980$$

! was too!

$$18x^2 - 60x + 33x - 110$$

$$= 6x(3x - 10) + 11(3x - 10)$$

$$= (3x - 10)(6x + 11) = 0 \rightarrow$$

$$x \in \left\{ \frac{10}{3}, -\frac{11}{6} \right\}$$

#s 7-10 COMPLETE THE SQUARE

(7)

$$x^2 - 6x - 11 = x^2 - 6x + 3^2 - 9 - 11$$

$$= (x-3)^2 - 20 \stackrel{SETO}{=} 0 \rightarrow$$

$$(x-3)^2 = 20 \rightarrow$$

$$x-3 = \pm \sqrt{20} = \pm 2\sqrt{5} \Rightarrow$$

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

$$\textcircled{8} \quad x^2 - 5x + 1 = 0$$

$$\Rightarrow x^2 - 5x = -1$$

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

$$\Rightarrow \left(x - \frac{5}{2}\right)^2 = -\frac{24}{4} \Rightarrow$$

$$x - \frac{5}{2} = \pm \sqrt{-\frac{24}{4}} = \pm \frac{i\sqrt{24}}{2} \Rightarrow$$

$$\boxed{x = \frac{5 \pm i\sqrt{24}}{2}}$$

$$\textcircled{9} \quad 13x^2 + 7x + 4 = P(x) \Rightarrow$$

$$\frac{1}{13}P(x) = x^2 + \frac{7}{13}x + \frac{4}{13} \stackrel{\text{SET } 0}{\Rightarrow}$$

$$x^2 + \frac{7}{13}x + \left(\frac{7}{26}\right)^2 - \frac{49}{676} + \frac{4}{13} \cdot \frac{52}{52} = 0$$

$$\Rightarrow \left(x + \frac{7}{26}\right)^2 + \frac{208 - 49}{676} = 0$$

$$\begin{array}{r} 3 \overline{)159} \\ \text{Prime} \rightarrow 53 \end{array}$$

$$\left(x + \frac{7}{26}\right)^2 = -\frac{159}{676}$$

$$x + \frac{7}{26} = \pm \sqrt{-\frac{159}{676}} = \pm i \frac{\sqrt{159}}{26}$$

$$\Rightarrow \boxed{x = \frac{-7 \pm i\sqrt{159}}{26}}$$

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$$3x^2 + 14x - 24 = 0 \rightarrow$$

$$x^2 + \frac{14}{3}x - \frac{24}{3} = 0 \rightarrow x^2 + \frac{14}{3}x - 8 = 0$$

$$\rightarrow x^2 + \frac{14}{3}x = 8$$

$$x^2 + \frac{14}{3}x + \left(\frac{7}{3}\right)^2 = 8 + \frac{49}{9} = \frac{72 + 49}{9} = \frac{121}{9}$$

$$\Rightarrow \left(x + \frac{7}{3}\right)^2 = \frac{121}{9} \rightarrow$$

$$x + \frac{7}{3} = \pm \sqrt{\frac{121}{9}} = \pm \frac{11}{3}$$

$$x = \frac{-7 \pm 11}{3} \rightarrow \begin{cases} \frac{4}{3} \\ -\frac{18}{3} = -6 \end{cases}$$

$$\Rightarrow x \in \left\{ -6, \frac{4}{3} \right\}$$

Should factor

$$(3x - 4)(x + 6) = 3x^2 - 4x + 18x - 24 \checkmark$$

Important Technique for Conic Functions in Chapter 7:

$$P(x) = 3x^2 + 14x - 24 \rightarrow$$

$$\frac{P(x)}{3} = x^2 + \frac{14}{3}x - \frac{24}{3} = x^2 + \frac{14}{3}x + \left(\frac{7}{3}\right)^2 - \frac{49}{9} - 8$$

$$= \left(x + \frac{7}{3}\right)^2 - \frac{121}{9} = \frac{P(x)}{3}$$

$$-\frac{49}{9} - \frac{72}{9} = -\frac{121}{9}$$

$$\Rightarrow P(x) = 3 \left(x + \frac{7}{3}\right)^2 - \frac{121}{3}$$