

**1** Solve the equation

$$x(x - 1) = 6.$$

(Show at least two intermediate steps.)

I expand the left-hand side, make the right-hand side zero, and factor:

$$\begin{aligned} x(x - 1) &= 6; \\ x^2 - x &= 6; \\ x^2 - x - 6 &= 0; \\ (x - 3)(x + 2) &= 0; \\ x - 3 = 0 \text{ or } x + 2 &= 0; \\ x = 3 \text{ or } x &= -2. \end{aligned}$$

If you like, the solution set for  $x$  is  $\{-2, 3\}$ .

**2** Solve the inequality

$$-3 \leq \frac{3x - 4}{2} \leq 6$$

in the real number system. (Show at least two intermediate steps.)

There are three sides, and I must do the same operations to all of them:

$$\begin{aligned} -3 &\leq \frac{3x - 4}{2} \leq 6; \\ -6 &\leq 3x - 4 \leq 12; \\ -2 &\leq 3x \leq 16; \\ -\frac{2}{3} &\leq x \leq \frac{16}{3}. \end{aligned}$$

If you like, the solution set for  $x$  is  $[-2/3, 16/3]$ .

**3** Solve the equation

$$4x^2 - 4x + 5 = 0$$

in the complex number system. (Show at least enough work that I can tell which method —completing the square, quadratic formula, etc— you used.)

I'll use the quadratic formula, with  $a = 4$ ,  $b = -4$ , and  $c = 5$ . Then

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(4)(5)}}{2(4)} = \frac{4 \pm \sqrt{-64}}{8} = \frac{4 \pm 8i}{8} = \frac{1}{2} \pm i.$$

If you like, the solution set for  $x$  is  $\{1/2 + i, 1/2 - i\}$ .