

Random problems from Chapter 1 Test (Review)

Solve:

$$2) \quad \frac{2}{3}x + \frac{1}{2}(x-4) = x-4$$

multiply both sides by the LCD = 6, to clear denominators:

$$6 \left[\frac{2}{3}x + \frac{1}{2}(x-4) \right] = 6[x-4]$$

$$6 \cdot \frac{2x}{3} + 6 \cdot \frac{1}{2}(x-4) = 6x - 24$$

$$4x + 3(x-4) = 6x - 24$$

$$4x + 3x - 12 = 6x - 24$$

$$7x - 12 = 6x - 24$$

$$\begin{array}{r} -6x \qquad -6x \\ \hline x - 12 = -24 \\ \quad +12 \quad +12 \\ \hline \end{array}$$

$$\boxed{x = -12} \quad \text{and check}$$

$$3) \quad 6x^2 - 11x - 7 = 0$$

Step 1: $ac = 6 \cdot (-7) = -42$

Step 2: Find p, q so that i) $p \cdot q = -42$
and ii) $p + q = b = -11$

so $p = -14, q = 3$

Step 3: Use p, q to split the middle term

$$6x^2 - 11x - 7 = 0$$

$$6x^2 - 14x + 3x - 7 = 0$$

Step 4: Factor by grouping:

$$(6x^2 - 14x) + (3x - 7) = 0$$

$$2x(3x - 7) + 1(3x - 7) = 0$$

$$(2x + 1)(3x - 7) = 0$$

$$2x + 1 = 0 \quad \text{or} \quad 3x - 7 = 0$$

$$2x = -1$$

$$3x = 7$$

$$\boxed{x = -\frac{1}{2}}$$

or

$$\boxed{x = \frac{7}{3}}$$

Same problem by the quadratic formula:

$$6x^2 - 11x - 7 = 0 \quad \text{so} \quad a = 6, b = -11, c = -7$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-11) \pm \sqrt{289}}{2(6)}$$

$$= \frac{11 \pm \sqrt{17^2}}{12} = \frac{11 \pm 17}{12} = \begin{cases} \frac{11+17}{12} = \frac{28}{12} = \frac{7}{3} \\ \frac{11-17}{12} = \frac{-6}{12} = -\frac{1}{2} \end{cases} \quad \text{or}$$

(3)

$$4) \quad (3x+1)^2 = 8$$

$$3x+1 = \pm\sqrt{8} = \pm\sqrt{4}\sqrt{2} = \pm 2\sqrt{2}$$

$$3x = -1 \pm 2\sqrt{2}$$

$$x = \frac{-1 \pm 2\sqrt{2}}{3}$$

[see §1.4 Quadratic Equations]

§1.4
p121

38) Solve by "completing the square"

$$x^2 - 7x + 12 = 0$$

$$x^2 - 7x = -12$$

$$x^2 - 7x + \frac{49}{4} = -12 + \frac{49}{4}$$

$$\left(x - \frac{7}{2}\right)^2 = \frac{-48}{4} + \frac{49}{4} = \frac{1}{4}$$

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

$$x - \frac{7}{2} = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{2} = \pm\frac{1}{2}$$

$$x = \frac{7}{2} \pm \frac{1}{2} = \begin{cases} \frac{8}{2} = 4 \\ \frac{6}{2} = 3 \end{cases}$$

scratch

$$\begin{array}{l} \text{i) } \frac{1}{2}(-7) = -\frac{7}{2} \\ \text{ii) } \left(-\frac{7}{2}\right)^2 = \frac{49}{4} \end{array}$$

Chap 1 Test (P181)

16) Complex arithmetic

$$\begin{aligned} \text{a)} \quad (9-3i) - (4+5i) &= 9-3i-4-5i \\ &= 5-8i \end{aligned}$$

$$\begin{aligned} \text{b)} \quad (4+3i)(-5+3i) \\ &= -20 + 12i - 15i + 9i^2 \\ &= -20 - 3i + 9(-1) = -29 - 3i \end{aligned}$$

$$\begin{aligned} \text{c)} \quad (8+3i)^2 &= 8^2 + 2(8)(3i) + (3i)^2 \\ &= 64 + 48i + 9i^2 \\ &= 64 + 48i - 9 \quad \left. \begin{array}{l} \text{use that} \\ i^2 = -1 \end{array} \right\} \\ &= 55 + 48i \end{aligned}$$

↓ Added after
class
ended.

$$\begin{aligned} \text{d)} \quad \frac{3+19i}{1+3i} &= \frac{3+19i}{1+3i} \cdot \frac{1-3i}{1-3i} = \frac{3-9i+19i-57i^2}{1-9i^2} \\ &= \frac{3+10i-57(-1)}{1-9(-1)} = \frac{60+10i}{10} \\ &= \frac{60}{10} + \frac{10i}{10} = 6+i \end{aligned}$$