

121 §3.4 #5 2, 5, 10, 12, 21, 29, 31, 38, 43, 50, 57
 #51-10 Find all real & imaginary solns
 to each eqn. Check your work

(2) $x^3 - x^2 - 5x + 5 = 0$

$x^2(x-1) - 5(x-1) = 0$

$(x-1)(x^2-5) = 0$

$(x-1)(x-\sqrt{5})(x+\sqrt{5}) = 0$

$x \in \{-\sqrt{5}, \sqrt{5}, 1\}$

Checks by
 synthetic division

$\begin{array}{r|rrrr} 1 & 1 & -1 & -5 & 5 \\ & & 1 & 0 & -5 \\ \hline & 1 & 0 & -5 & 0 \end{array}$

$\begin{array}{r|rrrr} \sqrt{5} & 1 & -1 & -5 & 5 \\ & & \sqrt{5} & 5-\sqrt{5} & -5 \\ \hline & 1 & \sqrt{5}-1 & -\sqrt{5} & 0 \end{array}$

$\begin{array}{r|rrrr} -\sqrt{5} & 1 & -1 & -5 & 5 \\ & & -\sqrt{5} & 5+\sqrt{5} & -5 \\ \hline & 1 & -\sqrt{5}-1 & \sqrt{5} & 0 \end{array}$

(5) $a^3 + 5a = 15a^2$

$a^3 - 15a^2 + 5a = 0$

$a(a^2 - 15a + 5) = 0$

$a \in \left\{ 0, \frac{15 \pm \sqrt{205}}{2} \right\}$

$a = 0$ OR $a^2 - 15a + 5 = 0$

$5 \overline{) 205}$
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$a^2 - 15a + \left(\frac{15}{2}\right)^2 = -5 + \frac{225}{4} = \frac{-20 + 225}{4}$

$\left(a - \frac{15}{2}\right)^2 = \frac{205}{4}$

$a - \frac{15}{2} = \pm \sqrt{\frac{205}{4}} = \pm \frac{\sqrt{205}}{2}$

$a = \frac{15 \pm \sqrt{205}}{2}$

121 $S_{3,4} \#s 10, 12, 21, 29, 31, 38, 43, 50, 57$

(10) $w^4 + 8w = 0$

$$w(w^3 + 8) = 0$$

$$w(w+2)(w^2 + 2w + 4) = 0$$

$$w=0, w=-2, \text{ OR } w^2 + 2w + 4 = 0$$

$$w^2 + 2w + 1 = -4 + 1$$

$$(w+1)^2 = -3$$

$$w+1 = \pm\sqrt{-3} = \pm i\sqrt{3}$$

$$w = -1 \pm i\sqrt{3}$$

$$w \in \{-2, 0, 1 \pm i\sqrt{3}\}$$

#s 11-34. Find all real solutions to each eq'n.

Check your answers

Scratch:

(12) $\sqrt{x-1} = x-7$

$$(\sqrt{x-1})^2 = (x-7)^2$$

$$x-1 = x^2 - 14x + 49$$

$$x^2 - 14x + 49 = x - 1$$

$$x^2 - 15x + 50 = 0$$

$$(x-5)(x-10) = 0$$

$$x \in \{5, 10\}$$

$$(x-7)^2 = x^2 - 14x + 49$$

$$\sqrt{5-1} = 5-7$$

$$\sqrt{4} = -2$$

$$2 = -2 \text{ NO}$$

$$\sqrt{10-1} = 10-7$$

$$\sqrt{9} = 3$$

$$3 = 3 \checkmark$$

$$x \in \{10\}$$

121 $\{3, 4, \dots, 21, 29, 31, 38, 43, 50, 57\}$

(21) $\sqrt{x+40} - \sqrt{x} = 4$

Needs to be squared twice.

$$(\sqrt{x+40} - \sqrt{x})^2 = 4^2$$

$$(\sqrt{x+40})^2 - 2\sqrt{x+40}\sqrt{x} + (\sqrt{x})^2 = 16$$

$$x+40 - 2\sqrt{x}\sqrt{x+40} + x = 16$$

$$2x - 2\sqrt{x(x+40)} = 16 - 40$$

$$-2\sqrt{x(x+40)} + 2x = -24$$

$$\sqrt{x(x+40)} - x = 12$$

$$\sqrt{x(x+40)} = x+12$$

$$(\sqrt{x(x+40)})^2 = (x+12)^2$$

$$x(x+40) = x^2 + 24x + 144$$

$$x^2 + 40x = x^2 + 24x + 144$$

$$40x = 24x + 144$$

$$16x = 144$$

$$16x = \frac{144}{16} = \frac{18}{2} = 9$$

$$x \in \{9\}$$

Check:

$$\sqrt{9+40} - \sqrt{9} = 4$$

$$\sqrt{49} - 3 = 4$$

$$7 - 3 = 4 \checkmark$$

121 \rightarrow 3, 4 #s 29, 31, 38, 43, 50, 57

(29) $w^{-\frac{1}{5}} = 16$

$(w^{-\frac{1}{5}})^{-5} = 16^{-5}$

$w \in \left\{ \frac{1}{8} \right\}$

$w = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{\left(\sqrt[4]{16}\right)^3} = \frac{1}{2^3} = \frac{1}{8}$

$16^{\frac{1}{4}} = \left(16^3\right)^{\frac{1}{4}}$ OR $\left(16^{\frac{1}{4}}\right)^3 = \left(\sqrt[4]{16}\right)^3 = (2)^3 = 8$

(31) $t^{-\frac{1}{2}} = 7$

$(t^{-\frac{1}{2}})^{-2} = 7^{-2}$

$t \in \left\{ \frac{1}{49} \right\}$

$t = 7^{-2} = \frac{1}{7^2} = \frac{1}{49}$

#s 35-52

(38) $x^4 - x^2 - 12 = 0$

$u^2 - u - 12 = 0$

$(u-4)(u+3) = 0$

$u = 4$ OR $u = -3$

$x^2 = 4$

$x = \pm 2$

$x^2 = -3$

$x = \pm i\sqrt{3}$

Find all real and imaginary solutions to each equation.

$x \in \left\{ \pm 2, \pm i\sqrt{3} \right\}$

(43) $\frac{1}{(5x-1)^2} + \frac{1}{(5x-1)} - 12 = 0$

$u^2 + u - 12 = 0$

$(u+4)(u-3) = 0$

$\Rightarrow u = -4$ OR $u = 3$

121 $\{3, 4, 5, 43, 50, 57\}$

(43) cont'd

$$u = -4 \quad \text{OR} \quad u = 3$$

$$\frac{1}{5x-1} = -4 \quad \text{OR} \quad \frac{1}{5x-1} = 3$$

$$1 = -4(5x-1)$$

$$1 = -20x + 4$$

$$20x = 3$$

$$x = \frac{3}{20}$$

$$1 = 3(5x-1)$$

$$1 = 15x - 3$$

$$4 = 15x$$

$$\frac{4}{15} = x$$

$$x \in \left\{ \frac{3}{20}, \frac{4}{15} \right\}$$

(50) $h+1 = 2h^{\frac{1}{2}} \quad u = h^{\frac{1}{2}} \Rightarrow$

$$h - 2h^{\frac{1}{2}} + 1 = 0$$

$$u^2 - 2u + 1 = 0$$

$$(u-1)^2 = 0$$

$$u = 1$$

$$h^{\frac{1}{2}} = u = 1 \Rightarrow$$

$$h = 1$$
$$h \in \{1\}$$

(57) Solve the absolute value eq'n.

$$|x^2 - x - 6| = 6$$

$$x^2 - x - 6 = 6$$

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

$$(x-4)(x+3) = 0$$

OR $x^2 - x - 6 = -6$

$$x^2 - x = 0$$

$$x(x-1) = 0$$

OR

$$x \in \{-3, 0, 1, 4\}$$