

### Practice Problems

1.)  $w^4 - 15w^2 - 16 = 0$  Let  $X = w^2$

$$\Rightarrow X^2 - 15X - 16 = 0$$

$$\Rightarrow (X-16)(X+1) = 0$$

$$\Rightarrow X = 16 \text{ OR } X = -1$$

sub back

$$\Rightarrow w^2 = 16 \text{ OR } w^2 = -1$$

$$\Rightarrow w = \pm 4 \text{ OR } w = \pm i$$

2.)  $x^2 - 10x + 24 < 0$

$$\Rightarrow X^2 - 10X + 24 < 0$$

$$\Rightarrow (X-6)(X-4) < 0$$

$$\Rightarrow \begin{array}{ccccccc} & & 0 & & 0 & & \\ & & \downarrow & & \downarrow & & \\ + & & - & & + & & \\ & & 4 & & 6 & & \end{array}$$

sign diagram.

$$4 < x < 6$$

Also (4, 6)

3.)  $\sqrt{x+10} - \sqrt{x+5} = 1$

$$\Rightarrow \sqrt{x+10} = 1 + \sqrt{x+5}$$

$$\Rightarrow x+10 = (1 + \sqrt{x+5})^2$$

$$\Rightarrow x+10 = 1 + 2\sqrt{x+5} + (x+5)$$

$$\Rightarrow 4 = 2\sqrt{x+5}$$

$$\Rightarrow 2 = \sqrt{x+5}$$

$$\Rightarrow 4 = x+5$$

$$\Rightarrow x = -1$$

check ✓

4.)  $\frac{x^2 - 7x + 10}{x+3} \geq 0$

$$\Rightarrow \frac{(x-5)(x-2)}{x+3} \geq 0$$

$$\Rightarrow \begin{array}{ccccccc} & & \text{undefined } \circledast & & 0 & & \\ & & \downarrow & & \downarrow & & \\ - & & + & & - & & + \\ & & -3 & & 2 & & 5 \end{array} \rightarrow x$$

sign diagram

$$\Rightarrow -3 < x \leq 2 \text{ OR } 5 \leq x$$

$$(-3, 2] \cup [5, \infty)$$

$$5.) x+2 = \sqrt[3]{12x+8}$$

$$\Rightarrow (x+2)^3 = 12x+8$$

$$\Rightarrow x^3 + \cancel{6}x^2 + \cancel{12}x + \cancel{8} = 12x+8$$

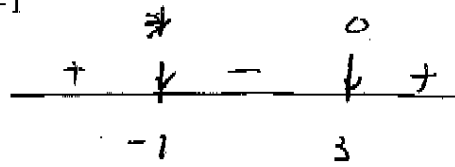
$$\Rightarrow \cancel{x^3} + 2x^2 + \cancel{8x} = 0 \Rightarrow x^2 + 6x^2 = 0 \quad -1 < x \leq 3$$

$$\Rightarrow \cancel{x(x^2 + 2x - 8)} = 0 \Rightarrow x^2(x+6) = 0$$

$$\Rightarrow \cancel{x(x+4)(x-2)} = 0 \Rightarrow x=0 \text{ OR } x=-6 \quad \text{Also } (-1, 3]$$

$$\Rightarrow \cancel{x=0 \text{ OR } x=-4 \text{ OR } x=2}$$

$$6.) \frac{3x-9}{x+1} \leq 0$$



Sign diagram.

$$7.) x+1 = \sqrt{x+3}$$

$$\Rightarrow (x+1)^2 = x+3$$

$$\Rightarrow x^2 + 2x + 1 = x + 3$$

$$\Rightarrow x^2 + x - 2 = 0$$

$$\Rightarrow (x+2)(x-1) = 0$$

$$\Rightarrow x = -2 \text{ OR } x = 1$$

check

$x=1$	$x=-2$
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$$9.) t^2 - t^{-1} - 42 = 0$$

$$\Rightarrow \left(\frac{1}{t}\right)^2 - \left(\frac{1}{t}\right) - 42 = 0$$

$$\Rightarrow w^2 - w - 42 = 0$$

$$\Rightarrow (w-7)(w+6) = 0$$

$$\Rightarrow w = 7 \text{ OR } w = -6$$

sub back

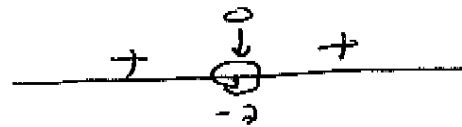
$$\Rightarrow \frac{1}{t} = 7 \text{ OR } \frac{1}{t} = -6$$

$$\Rightarrow t = \frac{1}{7} \text{ OR } t = -\frac{1}{6}$$

$$8.) x^2 + 14x > -49$$

$$\Rightarrow x^2 + 14x + 49 > 0$$

$$\Rightarrow (x+7)^2 > 0$$



Sign diagram.

$$x < -7 \text{ OR } x > -7$$

$$\text{Also } (-\infty, -7) \cup (-7, \infty)$$

$$\text{Let } w = \frac{1}{t}$$

$$(10.) x^3 - 5x^2 - 9x + 45 = 0$$

$$\Rightarrow (x^3 - 5x^2) - (9x - 45) = 0$$

$$\Rightarrow x^2(x-5) - 9(x-5) = 0$$

$$\Rightarrow (x^2 - 9)(x-5) = 0$$

$$\Rightarrow (x+3)(x-3)(x-5) = 0$$

$$\Rightarrow x = \pm 3 \text{ OR } x = 5$$