## Strategy for Solving Radical Equations Notes

a) Identify restrictions for the radicand(s) and state any new restrictions at each stage.
b) Isolate the radical term or the most complex radical term, if there are radicals on both sides
c) Square both sides.
d) Identify any extraneous roots based on the restrictions.
e) See if the solution makes sense. * Both side positive or negative.

1. Solve the following radical equations **algebraically.** State any new restrictions at each stage and identify any extraneous roots based on the restrictions.

a) $\sqrt{2x-11}=9$

$2x-11 \geq 0$
$2x \geq 11$
$x \geq \frac{11}{2}$

$2x-11=81$
$2x=92$
$x=46$

yes!

b) $\sqrt{5x+6}+4=2$

$5x+6 \geq 0$
$5x \geq -6$
$x \geq -\frac{6}{5}$

$\sqrt{5x+6}=-2$

∴ no solution

the radical cannot become a negative

$\sqrt{19x+6} \rightarrow$ positive
∴ $2x+3 \geq 0$
∴ there's an restriction.

c) $\sqrt{19x+6}=2x+3$

$19x+6 \geq 0$
$19x \geq -6$
$x \geq -\frac{6}{19}$.

$2x+3 \geq 0$
$2x \geq -3$
$x \geq -\frac{3}{2}$

$19x+6=(2x+3)^2$
$19x+6=4x^2+12x+9$.
$4x^2-7x+3=0$
$(4x-3)(x-1)=0$.

$-\frac{3}{2}$ $\quad -\frac{6}{19}$ $\quad 0$

$x=1$ or
$x=\frac{3}{4}$.

$x-3 \geq 0$
$x \geq 3$

d) $\sqrt{2x+3}-\sqrt{x+2}=2$

$x \geq -\frac{3}{2}$
$x \geq -2$
$\rightarrow \boxed{x \geq -\frac{3}{2}}$

$(\sqrt{2x+3})^2=(2+\sqrt{x+2})^2 \longrightarrow (a+b)^2 \rightarrow (a^2+2ab+b^2)$
$2x+3=4+4\sqrt{x+2}+x+2$
$2x+3=6+4\sqrt{x+2}+x$

$x-3=4\sqrt{x+2}$

$\geq 0$

$(x-3)^2=(4\sqrt{x+2})^2$

$x-3 \geq 0$
$x \geq 3$

$x^2-6x+9=16(x+2)$
$x^2-6x+9=16x+32$
$x^2-22x-23=0$ $\qquad x=-1$ or $x=23$
$(x-23)(x+1)=0$

∴ $x=23$

Practice Solving Rational Equations Name: Clover Date:_____

1. Solve the following rational equations algebraically. Identify any non-permissible values and reject any non-permissible values that appear as solutions.

a) $\left[\frac{x}{4}-\frac{x+3}{6}=\frac{x-3}{3}\right]12$

$3x-2(x+3)=4(x-3)$

$3x-2x-6=4x-12$

$-3x=-6$

$x=2$ //

b) $\left[\frac{5}{2x}-\frac{7}{10x}=\frac{3}{x-2}\right]10x(x-2)$ $x\neq 0, 2$

$5(5)(x-2)-7(x-2)=3(10x)$

$25(x-2)-7(x-2)=30x$

$25x-50-7x+14=30x$

$-12x=36$

$x=-3$ //

c) $\frac{x+3}{2x+1}=\frac{x+7}{5x+1}$ $x\neq -\frac{1}{2}, -\frac{1}{5}$

$(x+3)(5x+1)=(x+7)(2x+1)$

$5x^2+x+15x+3=2x^2+x+14x+7$

$5x^2+16x+3=2x^2+15x+7$

$3x^2+x-4=0$

$(3x+4)(x-1)=0$

$x=1, -\frac{4}{3}$ //

d) $\frac{1}{x-3}-\frac{2}{x+4}=\frac{7}{x^2+x-12}$ $x\neq 3$, $x\neq -4$

$\left[\frac{1}{x-3}-\frac{2}{x+4}=\frac{7}{(x+4)(x-3)}\right](x+4)(x-3)$

$x+4-2(x-3)=7$

$x+4-2x+6=7$

$-x=-3$

$x=3$ → reject

∴ no solution.

2. A student taking part in a biathlon race was required to cycle for 80 km and then run for 10 km. On average the cycling speed was four times as fast as the average running speed. If the event was completed in five hours, find the athlete's average cycling speed in km/h. ( Use the back of the sheet )

Let $x$ be the speed of running

Let $4x$ be the speed of cycling.

Solutions: a) 2 b) -3 c) -4/3 , 1 d) no solution 2. 24km/hr

$\frac{80}{4x}+\frac{10}{x}=5$

$80+40=20x$

$x=6$

$4x=6\times 4$

$=24$ km/h