Name: _____ Date: _____

Learning Goal 6.2	Solving equations, identifying any non-permissible values and extraneous roots.

Solve the following rational equations. State any non – permissible values and/or extraneous roots.

a. $\frac{4}{5}=\frac{8}{d}$

Non – Permissible Values:

$d \neq 0$

LCM$(5, d) = 5d$

$\left(\frac{4}{5}=\frac{8}{d}\right)\times 5d$

$d(4) = 5(8)$

$4d = 40$

$d = 10$

Check:

$\frac{4}{5}=\frac{8}{10}$

$\frac{4}{5}=\frac{4}{5}$

b. $\frac{1}{2x}-\frac{2}{5}=\frac{1}{10x}$

Non – Permissible Values:

$x \neq 0$

LCM$(2x, 5, 10x) = 10x$

$\left(\frac{1}{2x}-\frac{2}{5}=\frac{1}{10x}\right)\times 10x$

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

$5 - 4x = 1$

$-4x = -4$

$x = 1$

Check:

$\frac{1}{2(1)}-\frac{2}{5}=\frac{1}{10(1)}$

$\frac{1}{2}-\frac{2}{5}=\frac{1}{10}$

$\frac{5}{10}-\frac{4}{10}=\frac{1}{10}$

$\frac{1}{10}=\frac{1}{10}$

c. $\frac{5}{x}+\frac{6}{x^2}=6$ Non – Permissible Values: $x \neq 0$

$\left(\frac{5}{x}+\frac{6}{x^2}=6\right)\times x^2$ LCM$(x, x^2, 1) = x^2$

$x(5)+1(6)=x^2(6)$

$5x+6=6x^2$

$0=6x^2-5x-6$

$0=6x^2-5x-6$

$0=6x^2-9x+4x-6$

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

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

$x=-\frac{2}{3},\frac{3}{2}$

Check:

$$\frac{5}{\left(-{}^{2}/_{3}\right)}+\frac{6}{\left(-{}^{2}/_{3}\right)^2}=6$$

$$-\frac{15}{2}+\frac{54}{4}=6$$

$$-\frac{30}{4}+\frac{54}{4}=\frac{24}{4}$$

$$\frac{24}{4}=\frac{24}{4}$$

$$\frac{5}{\left({}^{3}/_{2}\right)}+\frac{6}{\left({}^{3}/_{2}\right)^2}=6$$

$$\frac{10}{3}+\frac{24}{9}=6$$

$$\frac{30}{9}+\frac{24}{9}=\frac{54}{9}$$

$$\frac{54}{9}=\frac{54}{9}$$

d. $\frac{1}{8}=1+\frac{2}{x}$ Non – Permissible Values: $x \neq 0$

$\left(\frac{1}{8}=1+\frac{2}{x}\right)\times 8x$ LCM$(8, 1, x) = 8x$

$x(1)=8x(1)+8(2)$

$x=8x+16$

$-7x=16$

$x=-\frac{16}{7}$

Check:

$$\frac{1}{8}=1+\frac{2}{\left(-{}^{16}/_{7}\right)}$$

$$\frac{1}{8}=1-\frac{14}{16}$$

$$\frac{2}{16}=\frac{16}{16}-\frac{14}{16}$$

$$\frac{2}{16}=\frac{2}{16}$$

e. $\frac{3w^2}{w+4}=5$

Non – Permissible Values:

$w+4\neq 0$

$w\neq -4$

$\left(\frac{3w^2}{w+4}=5\right)\times(w+4)$ LCM$(w+4,1)$ $=w+4$

$1(3w^2)=(w+4)(5)$

$3w^2=5w+20$

$3w^2-5w-20=0$

$3w^2-5w-20=0$

$w=\frac{-(-5)\pm\sqrt{(-5)^2-4(3)(-20)}}{2(3)}$

$w=\frac{5\pm\sqrt{25+240}}{6}$

$w=\frac{5\pm\sqrt{265}}{6}$

Check:

$\frac{3\left(\frac{5+\sqrt{265}}{6}\right)^2}{\left(\frac{5+\sqrt{265}}{6}\right)+4}=5$

$\frac{3\left(\left(5+\sqrt{265}\right)^2/36\right)}{\left(\frac{5+\sqrt{265}}{6}\right)+\frac{24}{6}}=5$

$\frac{\left(5+\sqrt{265}\right)^2/12}{29+\sqrt{265}/6}=5$

$\frac{\left(5+\sqrt{265}\right)^2/2}{29+\sqrt{265}}=5$

$\frac{25+10\sqrt{265}+265}{29+\sqrt{265}}=10$

$\frac{290+10\sqrt{265}}{29+\sqrt{265}}=10$

$\frac{10(29+\sqrt{265})}{29+\sqrt{265}}=10$

$10=10$

f. $1+\frac{v}{v-4}=2v$

Non – Permissible Values:

$v-4\neq 0$

$v\neq 4$

$\left(1+\frac{v}{v-4}=2v\right)\times(v-4)$ LCM$(v-4,1)$ $=v-4$

$(v-4)(1)+(1)(v)=(v-4)(2v)$

$v-4+v=2v^2-8v$

$0=2v^2-10v+4$

$\mathrm{v}=\frac{-(-10)\pm\sqrt{(-10)^2-4(2)(4)}}{2(2)}$

$\mathrm{v}=\frac{10\pm\sqrt{100-32}}{4}$

$\mathrm{v}=\frac{10\pm\sqrt{68}}{4}$

$\mathrm{v}=\frac{10\pm 2\sqrt{17}}{4}$

$\mathrm{v}=\frac{5\pm\sqrt{17}}{2}$

Check:

$1+\frac{\left(\frac{5+\sqrt{17}}{2}\right)}{\left(\frac{5+\sqrt{17}}{2}\right)-4}=2\left(\frac{5+\sqrt{17}}{2}\right)$

$1+\frac{\left(\frac{5+\sqrt{17}}{2}\right)}{\left(\frac{5+\sqrt{17}}{2}\right)-\frac{8}{2}}=5+\sqrt{17}$

$1+\frac{\left(\frac{5+\sqrt{17}}{2}\right)}{\left(\frac{-3+\sqrt{17}}{2}\right)}=5+\sqrt{17}$

$1+\frac{5+\sqrt{17}}{-3+\sqrt{17}}=5+\sqrt{17}$

$\frac{-3+\sqrt{17}+5+\sqrt{17}}{-3+\sqrt{17}}=5+\sqrt{17}$

$\frac{2+2\sqrt{17}}{-3+\sqrt{17}}\times\frac{-3-\sqrt{17}}{-3-\sqrt{17}}=5+\sqrt{17}$

$\frac{-6-8\sqrt{17}-34}{9-17}=5+\sqrt{17}$

$\frac{-40-8\sqrt{17}}{-8}=5+\sqrt{17}$

$5+\sqrt{17}=5+\sqrt{17}$

$$\frac{3\left(\frac{5-\sqrt{265}}{6}\right)^2}{\left(\frac{5-\sqrt{265}}{6}\right)+4}=5$$

$$\frac{3\left(\left(5-\sqrt{265}\right)^2/_{36}\right)}{\left(\frac{5-\sqrt{265}}{6}\right)+\frac{24}{6}}=5$$

$$\frac{\left(5-\sqrt{265}\right)^2/_{12}}{29-\sqrt{265}/_{6}}=5$$

$$\frac{\left(5-\sqrt{265}\right)^2/_{2}}{29-\sqrt{265}}=5$$

$$\frac{25-10\sqrt{265}+265}{29-\sqrt{265}}=10$$

$$\frac{290-10\sqrt{265}}{29-\sqrt{265}}=10$$

$$\frac{290-10\sqrt{265}}{29-\sqrt{265}}=10$$

$$\frac{10(29-\sqrt{265})}{29-\sqrt{265}}=10$$

$$10=10$$

$$1+\frac{\left(\frac{5-\sqrt{17}}{2}\right)}{\left(\frac{5-\sqrt{17}}{2}\right)-4}=2\left(\frac{5-\sqrt{17}}{2}\right)$$

$$1+\frac{\left(\frac{5-\sqrt{17}}{2}\right)}{\left(\frac{5-\sqrt{17}}{2}\right)-\frac{8}{2}}=5-\sqrt{17}$$

$$1+\frac{\left(\frac{5-\sqrt{17}}{2}\right)}{\left(\frac{-3-\sqrt{17}}{2}\right)}=5-\sqrt{17}$$

$$1+\frac{5-\sqrt{17}}{-3-\sqrt{17}}=5-\sqrt{17}$$

$$\frac{-3-\sqrt{17}+5-\sqrt{17}}{-3-\sqrt{17}}=5-\sqrt{17}$$

$$\frac{2-2\sqrt{17}}{-3-\sqrt{17}}\times\frac{-3+\sqrt{17}}{-3+\sqrt{17}}=5-\sqrt{17}$$

$$\frac{-6+8\sqrt{17}-34}{9-17}=5-\sqrt{17}$$

$$\frac{-40+8\sqrt{17}}{-8}=5-\sqrt{17}$$

$$5-\sqrt{17}=5-\sqrt{17}$$