Rational Operations and Solving Review

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Algebra 2 Name_____ ID: 1

Assignment Date_____ Period____

Simplify each and state the excluded values.

1) $\frac{3p^3 + 36p^2 + 60p}{p^2 + 12p + 20}$

2) $\frac{20r^3 - 20r}{20r^3 + 30r^2 + 10r}$

Simplify each expression.

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

4) $\frac{4n}{4n - 16} + \frac{8}{2}$

5) $\frac{7}{4} - \frac{2k + 2}{4k^2 + 20k}$

6) $\frac{2}{x - 6} - \frac{3}{x + 1}$

Simplify each and state the excluded values.

7) $\frac{2v - 2}{2v + 8} \cdot \frac{4v - 32}{v - 1}$

8) $\frac{56k - 40}{8k^3 + 56k^2} \cdot \frac{8k^2}{42k^3 - 30k^2}$

Simplify each expression.

9) $\frac{24 + 5x - x^2}{x^2 - 15x + 56} \cdot \frac{4x - 28}{x + 3}$

10) $\frac{8r + 24}{r^2 + 11r + 24} \div \frac{8}{6r^3 + 48r^2}$

Solve each equation. Remember to check for extraneous solutions.

11) $\frac{6}{r} = 1 - \frac{1}{r}$

12) $\frac{4}{r - 2} + \frac{7}{r^2 - 2r} = \frac{8}{r^2 - 2r}$

13) $\frac{8v - 2}{v^2 - 8v + 12} = \frac{1}{v - 6} + \frac{8}{v^2 - 8v + 12}$

14) $\frac{1}{x^2 - 6x + 5} + \frac{1}{x - 1} = \frac{2}{x^2 - 6x + 5}$

1) $\frac{3p^3 + 36p^2 + 60p}{p^2 + 12p + 20}$

GCF

$\frac{3p(p^2+12p+20)}{1(p^2+12p+20)} = 3p$

$(p+10)(p+2)$ $p \neq -10$ $p \neq -2$

$p+10=0$ $p+2=0$

$p=-10$ $p=-2$

$\sqrt{4}=2$ $\sqrt{9}=3$

$4x^2-9$

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

$r^2-1 \Rightarrow$ looks like

2) $\dfrac{20r^3 - 20r}{20r^3 + 30r^2 + 10r}$ ← GCF ← GCF $\dfrac{20r(r^2-1)}{10r(2r^2+3r+1)}$

Think

$20r(r^2) = 20r^3$

$r^2 - 1$

$\sqrt{1}=1 \quad \sqrt{1}=1$

$(r-1)(r+1)$

$\dfrac{20r(r+1)(r-1)}{10r(2r^2+3r+1)}$

FACTOR

$2r^2+3r+1$

$2(1)=2$

$1 \cdot 2 \quad 2 \cdot 1$

$-1 \cdot -2 \quad -2 \cdot -1$

$1+2=3 \quad 2+1=3$

$2 \quad \dfrac{20(r)(r+1)(r-1)}{10(r)(r+1)(2r+1)} \quad 1$

$r \neq 0$

$r \neq -1$

$r \neq -\frac{1}{2}$

$\dfrac{2(r-1)}{(2r+1)}$

$* \quad \dfrac{(2r+2)}{2}\dfrac{(2r+1)}{1}$

$(r+1)(2r+1)$

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Simplify each expression.

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

$\frac{4p}{3p} + \frac{2}{4p^2+32p}$

$\frac{4p}{3p} + \frac{2}{4p(p+8)}$

$\frac{2p(p+8)}{2p(p+8)} \cdot \frac{4}{3} + \frac{1}{2p(p+8)} \cdot \frac{(3)}{(3)}$

$\frac{4}{3} + \frac{12}{24p(p+8)}$

$\frac{8p(p+8)+3}{6p(p+8)}$

$\frac{(2p)(p+8)}{(2p)(p+8)} \cdot \frac{4}{3} + \frac{1}{2p(p+8)} \cdot \frac{(3)}{(3)}$

$8(3) = 24$

$\frac{8p(p+8)+3}{6p(p+8)} = \frac{8p^2+64p+3}{6p(p+8)}$

$\frac{(8p^2+64p+3)}{6p(p+8)}$

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

$3p = 0$
$p \neq 0$

$4p^2 + 32p = 0$
$4p(p+8) = 0$
$4p = 0 \quad p+8 = 0$
$p \neq 0 \quad p \neq -8$

$\frac{4}{3} \quad \frac{21}{24p(p+8)}$

$\frac{(2p(p+8))}{(2p(p+8))}\frac{4}{3} + \frac{1}{2p(p+8)} \cdot 3$

$\frac{4(2p)(p+8) + 3}{3(2p)(p+8)}$

$\frac{8p(p+8) + 3}{3(2p)(p+8)}$

$8p^2 + 64p + 3$

$8(3) = 24$
$24 \cdot 1 = 25$
$12 \cdot 2$
$8 \cdot 3$
$6 \cdot 4$

$\frac{8p^2 + 64p + 3}{3(2p)(p+8)}$

answer

4) $\frac{4n}{4n-16} + \frac{8}{2}$

$n \neq 4$

$4n - 16 \neq 0$

$4(n-4) \neq 0$

$n \neq 4$

$\frac{4n}{4(n-4)} + \frac{4}{1}$

$\frac{n}{(n-4)} + \frac{4}{1}$

$\frac{n}{(n-4)} + \frac{4}{1}\frac{(n-4)}{(n-4)}$

$\frac{n}{(n-4)} + \frac{4(n-4)}{(n-4)}$

$\frac{n + 4(n-4)}{(n-4)}$ combine

$\frac{n + 4n - 16}{(n-4)}$ combine

$\frac{(5n-16)}{(n-4)}$ answer

5) $\frac{7}{4} - \frac{2k+2}{4k^2+20k}$

$\frac{7}{4} - \frac{2(k+1)}{4k(k+5)}$

$\frac{2k(k+5)}{2k(k+5)}\frac{7}{4} - \frac{(k+1)(4)}{2k(k+5)(4)}$

$\frac{14k(k+5) - 4(k+1)}{4 \cdot 2k(k+5)}$

$\frac{14k^2+70k-4k-4}{8k(k+5)}$

$\boxed{\frac{14k^2+66k-4}{8k(k+5)}}$ answer

$k \neq -5$
$k \neq 0$

$\frac{2(7k^2+33k-2)}{4k(k+5)}$

$\frac{7k^2+33k-2}{4k(k+5)}$

$(k+5)$

$-5 \mid 14 \quad 66 \quad -4$
$\quad\quad\downarrow \quad -70 \quad 20$
$\quad 14 \quad -4 \quad (-16)$

(k)

$0 \mid 14 \quad 66 \quad -4$
$\quad\quad\downarrow \quad 0 \quad 0$
$\quad 14 \quad 66 \quad (-4)$

$$\frac{2}{(x-6)} - \frac{3}{(x+1)}$$

(x+1) (x+1)(x-6) (x-6)

$$\frac{2x+2-3x+18}{(x+1)(x-6)}$$

$$\frac{-x+20}{(x+1)(x-6)}$$

$x \neq 6$

$x \neq -1$

GCF FACTOR so cancel

7) $\dfrac{(2v-2)(4v-32)}{(2v+8)(v-1)}$

$\dfrac{2(v-1)\cdot 4(v-8)}{2(v+4)(v-1)}$

$\dfrac{2(v-1)\cdot 4(v-8)}{2(v+4)(v-1)}$

$\dfrac{4(v-8)}{(v+4)}$ $v \neq -4$, $v \neq 1$

10) $\dfrac{8r+24}{r^2+11r+24} \div \dfrac{8}{6r^3+48r^2}$

$6r^2(r+8)$

$r \neq 0 \quad r \neq -8$

$\dfrac{\dfrac{8r+24}{r^2+11r+24}}{\dfrac{8}{6r^3+48r^2}}$

$\dfrac{8r+24}{r^2+11r+24} \cdot \dfrac{6r^3+48r^2}{8}$

$3+8 \quad 1\cdot 24 \quad 2\cdot 12 \quad 3\cdot 8$

$\therefore$ Restrictions

$\dfrac{8(r+3)}{(r+3)(r+8)} \cdot \dfrac{(6r^2)(r+8)}{8}$

$r \neq -3$

$r \neq -8$

$6r^2$

$r \neq 0 \quad r \neq -8$

12) $\frac{4}{r-2} + \frac{7}{r^2-2r} = \frac{8}{r^2-2r}$

$-\frac{7}{r^2-2r}$ $-\frac{7}{r^2-2r}$

$$\frac{4}{r-2} = \frac{8}{r^2-2r} - \frac{7}{r^2-2r}$$

$$\frac{4}{r-2} = \frac{1}{r^2-2r}$$

GCF
FACTOR
Distr. back

$4(r^2-2r) = (r-2)$

$$\frac{4(r)(r-2)}{(r-2)} = \frac{(r-2)}{(r-2)}$$

$$\frac{4r}{4} = \frac{1}{4}$$

$r = 1/4$

$r \neq 2$ $r \neq 0$

$r-2=0$ $r^2=2r$

$(r)(r-2)=0$

$r=0$ $r-2=0$

$r=2$

14) $\frac{1}{x^2-6x+5}+\frac{1}{x-1}=\frac{2}{x^2-6x+5}$

$\frac{1}{x-1}=\frac{2}{x^2-6x+5}-\frac{1}{x^2-6x+5}$

$\frac{1}{x-1}=\frac{1}{x^2-6x+5}$

$x\neq 1$ $(x-5)(x-1)$

$x\neq 5$ $x\neq 1$

$\frac{1}{x-1}=\frac{1}{x^2-6x+5}$

$x^2-6x+5=x-1$

$\frac{(x-5)(x-1)}{(x-1)}=\frac{(x-1)}{(x-1)}$

$x-5=1$ $x\neq 1$ $x\neq 5$

$x=6$

8) $\frac{56k-40}{8k^3+56k^2} \cdot \frac{8k^2}{42k^3-30k^2}$

$\frac{8 \div 2}{6 \div 2} = \frac{4}{3}$

$\frac{4\cancel{8}(7k-5)}{\cancel{8k^2}(k+7)} \cdot \frac{\cancel{8k^2}}{3\cancel{6}k^2(7k-5)}$

$\frac{4}{3k^2(k+7)}$

$k \neq 0 \quad k \neq -7 \quad k \neq \frac{5}{7}$

$7k-5=0$
$7k=5$
$k=5/7$

$\frac{8\cdot(7k-5)}{8\cdot k^2\cdot(k+7)^3 6\cdot k^2\cdot(7k-5)} = \frac{4}{3k^2(k+7)}$

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4) $\frac{4n}{4n-16} + \frac{8}{2}$

$\frac{4n}{4(n-4)} + 4$

$\frac{n}{(n-4)} + \frac{4}{1}\frac{(n-4)}{(n-4)}$

combine $\frac{n + 4(n-4)}{(n-4)}$

$\frac{n + 4n - 16}{(n-4)}$

$\frac{(5n-16)}{(n-4)}$ answer

Restrictions

$\frac{4(n-4)}{4} = \frac{0}{4}$

$n - 4 = 0$

$n \neq 4$

5) $\frac{7}{4} - \frac{2k+2}{4k^2+20k}$

$\frac{k(k+5)\cdot 7}{(k(k+5))\cdot 4} - \frac{2(k+1)}{4k(k+5)}$

$\frac{7k(k+5) - 2(k+1)}{4k(k+5)}$

$\frac{7k^2+35k-2k-2}{4k(k+5)}$

$\frac{7k^2+33k-2}{4k(k+5)}$

$7k^2+33k-2$

-14

$-1\cdot 14$

$-2\cdot 7$

$-14\cdot 1$

$-7\cdot 2$

Restrictions

5) $\frac{7}{4} - \frac{2k+2}{4k^2+20k} = 0$

$4k(k+5)=0$

$4k=0 \quad k+5=0$

$k\neq 0 \quad k\neq -5$

6) $\frac{2}{x-6} - \frac{3}{x+1}$

Restrictions

6) $\frac{2}{x-6} - \frac{3}{x+1}$

$x-6=0 \quad x+1=0$

$x \neq 6 \quad x \neq -1$

Subtraction

- same denominator

$\frac{(x+1)}{(x+1)}\frac{2}{(x-6)} - \frac{3}{(x+1)}\frac{(x-6)}{(x-6)}$

$\frac{2(x+1) - 3(x-6)}{(x+1)(x-6) \quad (x+1)(x-6)}$

$\frac{2x+2-3x+18}{(x+1)(x-6)}$

$\frac{(-x+20)}{(x+1)(x-6)}$ $x \neq -1$, $x \neq 6$

7) $\frac{(2v-2)}{(2v+8)} \cdot \frac{(4v-32)}{(v-1)}$

Restrictions

7) $\frac{}{2v+8} \cdot \frac{}{v-1}$

$2v+8=0$

$2v=-8$

$v=-4$

$v \neq -4$

$v-1=0$

$v=1$

$v \neq 1$

$2(v-1) \cdot 4(v-8)$

7) $\frac{(2v-2) \cdot (4v-32)}{(2v+8) \cdot (v-1)}$

$2(v+4) \cdot (v-1)$

$\frac{2(v-1) \cdot 4(v-8)}{2(v+4)(v-1)} = \frac{4(v-8)}{(v+4)}$

9) $\frac{24+5x-x^2}{x^2-15x+56} \cdot \frac{4x-28}{x+3}$

$\frac{-x^2+5x+24}{x^2-15x+56} \cdot \frac{4x-28}{x+3}$

$\frac{-(x^2-5x-24)}{x^2-15x+56} \cdot \frac{4x-28}{x+3}$

$\frac{-1(x+3)(x-8)\cdot 4(x-7)}{(x-8)(x-7)\cdot(x+3)} = -4$

$x \neq 8 \quad x \neq 7 \quad x \neq -3$

10) $\frac{8r+24}{r^2+11r+24} \div \frac{8}{6r^3+48r^2}$

$\frac{(8r+24)}{(r^2+11r+24)} \cdot \frac{(6r^3+48r^2)}{(8)}$

$\frac{8(r+3)\cdot 6r^2(r+8)}{(r+3)(r+8)\cdot 8}$

$= 6r^2$

Restrictions

10) $\frac{8r+24}{r^2+11r+24} \div \frac{8}{6r^3+48r^2}$

$r^2+11r+24=0$ $6r^3+48r^2=0$

$(r+8)(r+3)=0$ $6r^2(r+8)=0$

$r \neq -8 \quad r \neq -3$ $6r^2=0$

$r \neq 0$

$\frac{6r^3+48r^2}{8}$ ← No restriction

11) $\frac{6}{r} = 1 - \frac{1}{r}$

$r\left[\frac{6}{r} = \frac{r}{r} - \frac{1}{r}\right]$

$6 = r - 1 \qquad r \neq 0$

$7 = r$

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12) $r\left(\frac{4}{r-2}\right)+\frac{7}{r^2-2r}=\frac{8}{r^2-2r}$

12) $\frac{4}{r-2}+\frac{7}{r^2-2r}=\frac{8}{r^2-2r}$

r^2-2r r^2-2r r^2-2r

$\left[\frac{4r}{r^2-2r}+\frac{7}{r^2-2r}=\frac{8}{r^2-2r}\right]$

$4r+7=8$

$4r=1$

$r=1/4$

12) $\frac{4}{r-2} + \frac{7}{r^2-2r} = \frac{8}{r^2-2r}$

$-\frac{7}{r^2-2r}$ $-\frac{7}{r^2-2r}$

$\frac{4}{r-2} = \frac{8}{r^2-2r} - \frac{7}{r^2-2r}$

$\frac{4}{r-2} = \frac{1}{r^2-2r}$

$4(r^2-2r) = (r-2)$

$4(r)(r-2) = (r-2)$

$\frac{(r-2)}{(r-2)} \quad \frac{(r-2)}{(r-2)}$

$\frac{4r}{4} = \frac{1}{4}$

$r = 1/4$

Restrictions

12) $\frac{4}{r-2} + \frac{7}{r^2-2r} = \frac{8}{r^2-2r}$

$r-2=0$

$r \neq 2$

r^2-2r

$r(r-2)=0$

$r=0 \quad r-2=0$

$r \neq 0 \quad r \neq 2$

14) $\frac{1}{x^2-6x+5}+\frac{1}{x-1}=\frac{2}{x^2-6x+5}$

(x-5)

(x-5)(x-1)

14) $\frac{1}{x^2-6x+5}+\frac{1}{x-1}=\frac{2}{x^2-6x+5}$

$\left[\frac{1}{(x-5)(x-1)}+\frac{(x-5)}{(x-5)(x-1)}=\frac{2}{(x-5)(x-1)}\right](x-5)(x-1)$

$x \neq 5$

$x=1$

$1+x-5=2$

$x-4=2$

$x=6$

13) $\frac{8v-2}{v^2-8v+12} = \frac{1}{v-6} + \frac{8}{v^2-8v+12}$

$(v-6)(v-2)$ $(v-6)(v-2)$

$\frac{8v-2}{(v-6)(v-2)} = \frac{1\cdot(v-2)}{(v-6)(v-2)} + \frac{8}{(v-6)(v-2)}$ $(v-6)(v-2)$

$8v-2 = (v-2)+8$

$8v-2 = v+6$

$7v-2 = 6$

$7v = 8$

$v = 8/7$

Restrictions

$v-6=0$ $v-2=0$

$v \neq 6$ $v \neq 2$

13) $\frac{8v-2}{v^2-8v+12} = \frac{1}{v-6} + \frac{8}{v^2-8v+12}$

13) $\frac{8v-2}{v^2-8v+12} = \frac{1}{v-6} + \frac{8}{v^2-8v+12}$

$(v-6)(v-2)$ $(v-6)$ $(v-6)(v-2)$

$v \neq 6$ $v \neq 2$ $v \neq 6$ $v \neq 6$ $v \neq 2$

$\frac{8v-2}{(v-6)(v-2)} - \frac{8}{(v-6)(v-2)} = \frac{1}{(v-6)}$

$v \neq 6$
$v \neq 2$

$\frac{8v-2-8}{(v-6)(v-2)} = \frac{1}{(v-6)}$

$\frac{(8v-10)}{(v-6)(v-2)} = \frac{1}{(v-6)}$

$\frac{(v-6)(8v-10)}{(v-6)} = \frac{(v-6)(v-2)}{(v-6)}$

$8v-10 = v-2$
$-v \quad -v$

$7v-10 = -2$
$+10 \quad +10$

$7v = 8$
$/7 \quad /7$

$v = 8/7$

14) $\frac{1}{x^2-6x+5}+\frac{1}{x-1}=\frac{2}{x^2-6x+5}$

Restrictions

$(x-5)(x-1)$ $(x-1)$ $(x-5)(x-1)$

$x\neq 5$ $x\neq 1$ $x\neq 1$ $x\neq 5$ $x\neq 1$

$x\neq 5$

$x\neq 1$

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

$\frac{1}{(x-1)}=\frac{1}{(x-5)(x-1)}$

$1\cdot(x-5)(x-1)=1\cdot(x-1)$

$\frac{(x-5)(x-1)}{(x-1)}=\frac{(x-1)}{(x-1)}$

$(x-5)=1$

$x-5=1$

$+5 \quad +5$

$x=6$

$x=6$

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12) $\frac{4}{r-2}+\frac{7}{r^2-2r}=\frac{8}{r^2-2r}$

$-\frac{7}{r^2-2r}$ $\quad$ $-\frac{7}{r^2-2r}$

$\frac{4}{r-2}=\frac{8}{r^2-2r}-\frac{7}{r^2-2r}$

$\frac{4}{r-2}=\frac{1}{r^2-2r}$

$\frac{4}{r-2}=\frac{1}{r(r-2)}$

$\frac{4r(r-2)}{(r-2)}=\frac{(r-2)}{(r-2)}$

$4\frac{r}{4}=\frac{1}{4}$

$r=\frac{1}{4}$

12) $\frac{4}{r-2}+\frac{7}{r^2-2r}=\frac{8}{r^2-2r}$

$\frac{}{r-2}+\frac{}{r^2-2r}=\frac{}{r^2-2r}$

$r-2=0$ $\quad$ $r(r-2)$

$r\neq 2$ $\quad$ $r=0$

$r\neq 0$

$r-2=0$

$r\neq 2$

$r\neq 0$

$r\neq 2$

10) $\dfrac{8r+24}{r^2+11r+24} \div \dfrac{8}{6r^3+48r^2}$

Restrictions

$\dfrac{8r+24}{r^2+11r+24} \div \dfrac{8}{6r^3+48r^2}$

$(r+3)(r+8)$ $6r^2(r+8)$

$r \neq -3$ $r \neq -8$ $6r^2 \neq 0$

$r \neq 0$

10) $\dfrac{8r+24}{r^2+11r+24} \div \dfrac{8}{6r^3+48r^2}$

$\dfrac{8r+24}{r^2+11r+24} \cdot \dfrac{6r^3+48r^2}{8}$ ← Restrict

$\dfrac{8(r+3)}{(r+3)(r+8)} \cdot \dfrac{6r^2(r+8)}{8}$

$\dfrac{8(r+3) \cdot 6r^2(r+8)}{(r+3)(r+8) \cdot 8}$

$6r^2$ answer

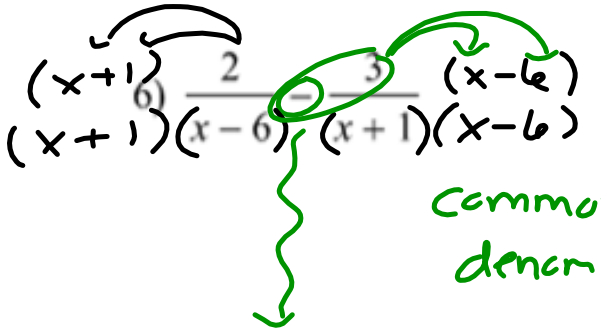
7) $\dfrac{(2v-2)\,(4v-32)}{(2v+8)\,(v-1)}$

$\dfrac{2(v-1)\cdot 4(v-8)}{(2v+8)\,(v-1)}$ GCF FACTOR

$2(v+4)\cdot(v-1)$

$\dfrac{2(v-1)\cdot 4(v-8)}{2(v+4)(v-1)} = \dfrac{4(v-8)}{(v+4)}$ answer

$v \neq -4 \quad v \neq 1$



common denominator

Restrictions

$x-6$ $x+1$

$x-6=0$ $x+1=0$

$x \neq 6$ $x \neq -1$

$$\frac{2x+2-3x+18}{(x+1)(x-6)}$$

$$\boxed{\frac{(-x+20)}{(x+1)(x-6)}}$$

answer

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5) $\frac{7}{4} - \frac{2k+2}{4k^2+20k}$

$\frac{k(k+5)7}{k(k+5)4} - \frac{2(k+1)}{4k(k+5)}$

Restrictions

$4k(k+5)=0$

$4k=0 \quad k+5=0$

$k \neq 0 \quad k \neq -5$

$\frac{7k(k+5)}{4k(k+5)} - \frac{2(k+1)}{4k(k+5)}$

$\frac{7k(k+5) - 2(k+1)}{4k(k+5)}$

$\frac{7k^2+35k-2k-2}{4k(k+5)}$

$\frac{7k^2+33k-2}{4k(k+5)}$

4) $\frac{4n}{(4n-16)} + \frac{8}{2}$

$4n-16=0$

$4(n-4)=0$

$n-4=0$

$n \neq 4$

$\frac{4n}{4(n-4)} + \frac{8}{2}$

$\frac{n}{(n-4)} + \frac{4}{1}\frac{(n-4)}{(n-4)}$

$\frac{n}{(n-4)} + \frac{4(n-4)}{(n-4)}$

$\frac{n+4n-16}{(n-4)} = \boxed{\frac{(5n-16)}{(n-4)}}$

Don't Do This $\frac{5n-16}{n-4}$

C 25 can't do this

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

$3p \quad 4p(p+8)$

$3p = 0$

$4p = 0$

$p+8 = 0$

$p \neq 0$

$p \neq 0$

$p \neq -8$

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

$\frac{4}{3} + \frac{1 \; 2 \div 2}{2 \; 4p(p+8) \div 2}$

$\frac{(2p(p+8))4}{(2p(p+8))3} + \frac{1}{2p(p+8)} \cdot 3$

$\frac{4(2p)(p+8) + 1 \cdot 3}{3 \cdot 2p(p+8)}$

$\frac{8p(p+8) + 3}{3 \cdot 2p(p+8)}$

$8p^2 + 64p + 3$

$8(3) = 24$

25
14
11
10

1 · 24
2 · 12
3 · 8
4 · 6

$\frac{8p^2 + 64p + 3}{3 \cdot 2p(p+8)}$

$\frac{8p^2 + 64p + 3}{6p(p+8)}$

Answers to Assignment (ID: 1)

1) $3p$; $\{-10, -2\}$

2) $\frac{2(r-1)}{2r+1}$; $\left\{0, -1, -\frac{1}{2}\right\}$

3) $\frac{8p^2+64p+3}{6p(p+8)}$

4) $\frac{5n-16}{n-4}$

5) $\frac{7k^2+33k-2}{4k(k+5)}$

6) $\frac{-x+20}{(x-6)(x+1)}$

7) $\frac{4(v-8)}{v+4}$; $\{-4, 1\}$

8) $\frac{4}{3k^2(k+7)}$; $\left\{0, -7, \frac{5}{7}\right\}$

9) -4

10) $6r^2$

11) $\{7\}$

12) $\left\{\frac{1}{4}\right\}$

13) $\left\{\frac{8}{7}\right\}$

14) $\{6\}$

1) $\frac{3p^3 + 36p^2 + 60p}{p^2 + 12p + 20}$

$(p+10)(p+2)$

$p \neq -10 \quad p \neq -2$

restrictions

$\frac{3p(p^2+12p+20)}{(p+10)(p+2)}$

$\frac{3p(p+10)(p+2)}{(p+10)(p+2)} = \frac{3p}{1} = 3p$

$\frac{5}{5} = 1$

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

$\frac{3p(p^2+12p+20)}{(p^2+12p+20)}$

2) $\dfrac{20r^3 - 20r}{20r^3 + 30r^2 + 10r}$ ← GCF 2 $\quad \dfrac{20r(r^2-1)}{10r(2r^2+3r+1)}$ ← GCF 10r

$20r^3 - 20r$

$20r(r^2-1)$

$20r^3 - 20r$

$r^2 - 1$

$r_1 \quad r_1$

$(r-1)(r+1)$

$\dfrac{2(r^2-1)}{(2r^2+3r+1)}$

$2(1) = 2$ → $2 \cdot 1$

$2+1=3$

$\dfrac{(2r+2)}{2}\dfrac{(2r+1)}{1}$

$\dfrac{2(r^2-1)}{(r+1)(2r+1)} = \dfrac{2(r+1)(r-1)}{(r+1)(2r+1)}$

$\dfrac{2(r-1)}{(2r+1)}$

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2) $\dfrac{20r^3 - 20r}{20r^3 + 30r^2 + 10r}$

GCF

$\dfrac{20r(r^2-1)}{10r(2r^2+3r+1)}$

Factor

$r^2 - 1$

$(r-1)(r+1)$

FACTOR

$2r^2+3r+1$

$2(1)=2$

Factors of 2: $1 \cdot 2$, $-1 \cdot -2$

Add factor to $(+3)$: $1+2=3$

$\dfrac{(2r+1)}{1}\dfrac{(2r+2)}{2}$

$(2r+1)(r+1)$

$$\frac{20r(r+1)(r-1)}{10r(2r+1)(r+1)}$$

$$\frac{2\cancel{20r}\cancel{(r+1)}(r-1)}{1\cancel{10r}(2r+1)\cancel{(r+1)}} = \frac{2(r-1)}{(2r+1)}$$

Restrictions

$r \neq 0$

$r \neq -\frac{1}{2}$

$r \neq -1$

Assignment

Simplify each and state the excluded values.

1) $\frac{3p^3 + 36p^2 + 60p}{p^2 + 12p + 20}$ $= 3p$ $x \neq -10$, $x \neq -2$

$\frac{3p(p^2+12p+20)}{1(p^2+12p+20)}$

Simplify each expression.

3) $\frac{4p}{3p} + \frac{2}{4p^2 + 32p}$

$\frac{4(p+8)}{4(p+8)}\frac{4p}{(3)(p)} + \frac{2}{(4)(p)(p+8)} \cdot 3$

$\frac{4(p+8)(4p) + 2(3)}{4(p+8)(3)(p)}$

$16p(p+8) + 6$