

**RATIONAL EXPRESSIONS**

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**Simplify each and state the excluded values.**

1) 
$$\frac{-x^2 + 14x - 40}{x^2 - 16x + 60}$$

2) 
$$\frac{p^2 + 16p + 64}{5p^2 + 40p}$$

3) 
$$\frac{k^2 - 13k + 30}{k^2 - 100}$$

4) 
$$\frac{24 - 5x - x^2}{x^2 - 9}$$

5) 
$$\frac{21n^2 - 35n}{14n^2 + 49n}$$

6) 
$$\frac{6m^2 - 12m}{m^2 - 4}$$

7) 
$$\frac{20x^2 + 100x}{20x^2 + 50x}$$

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

9) 
$$\frac{7n - 56}{n^2 - 64}$$

10) 
$$\frac{a^2 - 10a + 21}{a^2 - 9a + 14}$$

$$11) \frac{15x^2 - 36x + 21}{9x^2 + 21x - 30}$$

$$12) \frac{7n^2 - 76n + 60}{6n^3 - 39n^2 - 210n}$$

$$13) \frac{9b^2 + 52b + 35}{3b^3 - 18b^2}$$

$$14) \frac{30n^3 - 10n^2 - 140n}{30n^2 + 20n}$$

$$15) \frac{10r^3 + 40r^2 - 50r}{15r^3 - 69r^2 - 126r}$$

$$16) \frac{12k^3 + 8k^2}{15k^2 - 11k - 14} \cdot \frac{25k^2 - 70k + 49}{5k^2 + 38k - 63}$$

$$17) \frac{4x + 40}{12x - 16} \div \frac{30x^3 + 20x^2}{9x^2 - 6x - 8}$$

$$18) \frac{21a + 9}{2a^2 + a - 36} \div \frac{7a + 3}{2a^2 + 23a + 63}$$

$$19) \frac{x^2 + 14x + 45}{x - 1} \div \frac{4x^2 + 10x - 24}{24 - 10x - 4x^2}$$

$$20) \frac{2r^2 + 15r + 25}{10r^2 + 19r - 15} \div \frac{2r^2 - 28r + 90}{10r^2 - 56r + 30}$$

$$21) \frac{21n - 63}{3n^2 - 18n + 27} \div \frac{49n + 42}{21n^3 + 18n^2}$$

$$22) \frac{10p^2 + 40p}{2p^2 + 12p + 10} \cdot \frac{14p^2 + 62p - 40}{7p - 4}$$

$$23) \frac{14k^3 - 42k^2}{20k^3 - 60k^2} \div \frac{21k^3 - 42k^2}{9k^3 - 18k^2}$$

$$24) \frac{8p - 4}{16p^3 - 8p^2} \div \frac{28p - 12}{7p^2 - 59p + 24}$$

$$25) \frac{35m - 63}{5m^2 + 21m - 54} \div \frac{7m + 4}{7m^2 + 74m + 40}$$

$$26) \frac{5n - 25}{3n^2 + 2n - 40} \cdot \frac{-15n^2 + 74n - 80}{5n - 8}$$

$$27) \frac{21a^2 - 17a - 8}{5 + 13a - 6a^2} \div \frac{7a - 8}{12a^2 - 30a}$$

$$28) \frac{3x^2 + 25x + 42}{20x - 32} \cdot \frac{5x^2 - 53x + 72}{3x + 7}$$

$$29) \frac{3v^2 - 23v - 36}{15v^2 - 49v + 24} \div \frac{3v^2 - 5v - 12}{15v^2 - 49v + 24}$$

$$30) \frac{56 - 56n}{8n^3 - 80n^2} \cdot \frac{8n^2}{42n - 42}$$

$$31) (18x - 45) \cdot \frac{24x - 64}{6x^2 - 31x + 40}$$

$$32) \frac{49b - 56}{35b^3 + 63b^2} \div \frac{7b^2 - 71b + 72}{5b + 9}$$

$$33) \frac{12n - 18}{4n - 6} \cdot \frac{5n^2 - 26n - 63}{5n + 9}$$

$$34) \frac{10v^3 - 70v^2}{5v + 7} \cdot \frac{10v^2 + 64v + 70}{14v + 70}$$

$$35) \frac{49x^2 - 56x}{7x^2 + 34x - 48} \div \frac{7x + 5}{28x + 20}$$

**Simplify each expression.**

$$36) \frac{4}{2m} - \frac{m+3}{9m-3}$$

$$37) 3n + \frac{3n}{6n-36}$$

$$38) \frac{4}{n+4} + \frac{2n}{n+6}$$

$$39) \frac{2}{2p-2} + \frac{6}{p+5}$$

$$40) \frac{3}{2} - \frac{3m}{3m^2 - 3m}$$

$$41) \frac{4v}{6v} + \frac{v+4}{5v-1}$$

$$42) \frac{3x}{x+5} + \frac{4}{x-3}$$

$$43) \frac{3n}{n-3} + \frac{2n}{n+1}$$

$$44) \frac{b-1}{2b^2-8b} + \frac{5}{3b}$$

$$45) \frac{6x}{2} + \frac{x-3}{4x+4}$$

$$46) \frac{5}{x+1} + \frac{4}{3}$$

$$47) 4 - \frac{4}{x^2 + 2x - 15}$$

$$48) \frac{2a}{4a+12} + \frac{5}{3a}$$

$$49) \frac{r-3}{3r+18} + \frac{2r}{3}$$

$$50) \frac{5}{x-6} + \frac{2x}{x+2}$$

$$51) \frac{5}{k+4} + \frac{2}{k+3}$$

$$52) \frac{5}{x-5} + \frac{2x}{x-4}$$

$$53) \frac{6p}{3} - \frac{6}{p+6}$$

$$54) \frac{5n}{4n^3 - 12n^2} - 4$$

$$55) \frac{n-2}{3n+3} - \frac{4}{3}$$

# Answers to RATIONAL EXPRESSIONS

- |  |   |  |                                       |
|--|---|--|---------------------------------------|
| 1) $\frac{-x+4}{x-6}$ ; $\{10, 6\}$  | 2) $\frac{p+8}{5p}$ ; $\{0, -8\}$   | 3) $\frac{k-3}{k+10}$ ; $\{10, -10\}$                                    | 4) $-\frac{(8+x)}{x+3}$ ; $\{3, -3\}$ |
| 5) $\frac{3n-5}{2n+7}$ ; $\left\{0, -\frac{7}{2}\right\}$                          | 6) $\frac{6m}{m+2}$ ; $\{2, -2\}$   | 7) $\frac{2(x+5)}{2x+5}$ ; $\left\{0, -\frac{5}{2}\right\}$              | 8) $\frac{p-4}{p+2}$ ; $\{-2, -1\}$   |
| 9) $\frac{7}{n+8}$ ; $\{8, -8\}$   | 10) $\frac{a-3}{a-2}$ ; $\{7, 2\}$  | 11) $\frac{5x-7}{3x+10}$ ; $\left\{1, -\frac{10}{3}\right\}$             |                                       |
| 12) $\frac{7n-6}{3n(2n+7)}$ ; $\left\{0, 10, -\frac{7}{2}\right\}$                 | 13) $\frac{(b+5)(9b+7)}{3b^2(b-6)}$ ; $\{0, 6\}$                                | 14) $\frac{(3n-7)(n+2)}{3n+2}$ ; $\left\{0, -\frac{2}{3}\right\}$        |                                       |
| 15) $\frac{10(r-1)(r+5)}{3(r-6)(5r+7)}$ ; $\left\{0, 6, -\frac{7}{5}\right\}$      | 16) $\frac{4k^2}{k+9}$ ; $\left\{\frac{7}{5}, -\frac{2}{3}, -9\right\}$         | 17) $\frac{x+10}{10x^2}$ ; $\left\{\frac{4}{3}, -\frac{2}{3}, 0\right\}$ |                                       |
| 18) $\frac{3(a+7)}{a-4}$ ; $\left\{4, -\frac{9}{2}, -7, -\frac{3}{7}\right\}$      | 19) $\frac{(x+9)(x+5)}{-(x-1)}$ ; $\left\{1, \frac{3}{2}, -4\right\}$           | 20) $\frac{r+5}{r-9}$ ; $\left\{\frac{3}{5}, -\frac{5}{2}, 5, 9\right\}$ |                                       |
| 21) $\frac{3n^2}{n-3}$ ; $\left\{3, 0, -\frac{6}{7}\right\}$                       | 22) $\frac{10p(p+4)}{p+1}$ ; $\left\{-5, -1, \frac{4}{7}\right\}$               | 23) $\frac{3}{10}$ ; $\{0, 3, 2\}$                                       |                                       |
| 24) $\frac{p-8}{8p^2}$ ; $\left\{0, \frac{1}{2}, 8, \frac{3}{7}\right\}$           | 25) $\frac{7(m+10)}{m+6}$ ; $\left\{\frac{9}{5}, -6, -10, -\frac{4}{7}\right\}$ |  |                                       |
| 26) $-\frac{5(n-5)}{n+4}$ ; $\left\{\frac{10}{3}, -4, \frac{8}{5}\right\}$         | 27) $-6a$ ; $\left\{\frac{5}{2}, -\frac{1}{3}, 0, \frac{8}{7}\right\}$          | 28) $\frac{(x+6)(x-9)}{4}$ ; $\left\{\frac{8}{5}, -\frac{7}{3}\right\}$  |                                       |
| 29) $\frac{v-9}{v-3}$ ; $\left\{\frac{8}{3}, \frac{3}{5}, 3, -\frac{4}{3}\right\}$ | 30) $-\frac{4}{3(n-10)}$ ; $\{0, 10, 1\}$                                       | 31) 72; $\left\{\frac{5}{2}, \frac{8}{3}\right\}$                        |                                       |
| 32) $\frac{1}{b^2(b-9)}$ ; $\left\{0, -\frac{9}{5}, 9, \frac{8}{7}\right\}$        | 33) $3(n-7)$ ; $\left\{\frac{3}{2}, -\frac{9}{5}\right\}$                       | 34) $\frac{10v^2(v-7)}{7}$ ; $\left\{-\frac{7}{5}, -5\right\}$           |                                       |
| 35) $\frac{28x}{x+6}$ ; $\left\{\frac{8}{7}, -6, -\frac{5}{7}\right\}$             | 36) $\frac{15m-6-m^2}{3m(3m-1)}$  | 37) $\frac{6n^2-35n}{2(n-6)}$  | 38) $\frac{12n+24+2n^2}{(n+6)(n+4)}$  |
| 39) $\frac{7p-1}{(p-1)(p+5)}$  | 40) $\frac{3m-5}{2(m-1)}$   | 41) $\frac{13v+10}{3(5v-1)}$   | 42) $\frac{3x^2-5x+20}{(x-3)(x+5)}$   |
| 43) $\frac{5n^2-3n}{(n-3)(n+1)}$   | 44) $\frac{13b-43}{6b(b-4)}$  | 45) $\frac{12x^2+13x-3}{4(x+1)}$   | 46) $\frac{19+4x}{3(x+1)}$            |
| 47) $\frac{4x^2+8x-64}{(x-3)(x+5)}$  | 48) $\frac{3a^2+10a+30}{6a(a+3)}$   | 49) $\frac{13r-3+2r^2}{3(r+6)}$  | 50) $\frac{-7x+10+2x^2}{(x-6)(x+2)}$  |
| 51) $\frac{7k+23}{(k+4)(k+3)}$   | 52) $\frac{-5x-20+2x^2}{(x-5)(x-4)}$  | 53) $\frac{2p^2+12p-6}{p+6}$   | 54) $\frac{-16n^2+48n+5}{4n(n-3)}$    |
| 55) $\frac{-n-2}{n+1}$   |   |  |                                       |