

Difficult

Solve each equation. Remember to check for extraneous solutions.

1)
$$\frac{n-5}{n^2+4n-12} = \frac{1}{n^2+4n-12} - \frac{1}{3}$$

2)
$$\frac{a^2-3a-4}{2a^2-a} = \frac{a-1}{a} + \frac{5}{a}$$

3)
$$\frac{1}{n^2+9n+20} = \frac{1}{n+5} - \frac{3n^2-15n-72}{n^2+9n+20}$$

4)
$$\frac{8}{a} + \frac{a-7}{a-1} = \frac{a-5}{a}$$

5)
$$\frac{2p+2}{p^2-2p-8} + \frac{p+6}{4p+8} = \frac{1}{p+2}$$

6)
$$\frac{7}{n^2} = \frac{2n+14}{n^3-8n^2} - \frac{n^2+n-2}{n^3-8n^2}$$

7)
$$\frac{7b-56}{b-3} = \frac{5b^2+30b+45}{b^2-11b+24} + \frac{1}{b-3}$$

8)
$$\frac{1}{3} = \frac{n-4}{3n-24} + \frac{1}{3n^2-15n-72}$$

9)
$$\frac{x-3}{21x^2-18x} = \frac{x}{21x-18} - \frac{1}{7x^2-6x}$$

10)
$$\frac{2}{k} = \frac{k^2-k-6}{4k} - \frac{k+6}{4}$$

11)
$$\frac{r-3}{r^2+7r} = \frac{1}{r^3+7r^2} + \frac{r-5}{r^2+7r}$$

12)
$$\frac{x-6}{x} = \frac{21x+28}{x} - \frac{x+8}{x^2+2x}$$

13)
$$\frac{1}{3x^2-21x+36} = \frac{1}{3x-9} - \frac{x^2-2x-15}{3x^2-21x+36}$$

14)
$$\frac{x+1}{x+7} + \frac{8x+24}{x} = \frac{6}{x^2+7x}$$

15)
$$\frac{r^2-3r-4}{r^2-5r} - \frac{1}{r-5} = \frac{r+2}{r-5}$$

16)
$$\frac{12n-24}{n^2} = \frac{1}{n-1} + \frac{n-5}{n^2-n}$$

17)
$$\frac{m^2-4m+4}{m^2+2m} + \frac{1}{m^2+2m} = \frac{m-8}{m}$$

18)
$$\frac{n+5}{2n+12} = \frac{1}{2} - \frac{1}{2n^2+12n}$$

19)
$$\frac{m^2-2m-8}{2m^2-2m-40} + \frac{4}{m^2-m-20} = \frac{1}{2}$$

20)
$$\frac{n+3}{n^2-7n} = \frac{n-4}{n} + \frac{1}{n}$$

21)
$$\frac{x+5}{x^2} = \frac{x+7}{x^2+5x} - \frac{1}{x^3+5x^2}$$

22)
$$\frac{2}{n} = \frac{n-2}{n^3+4n^2} + \frac{1}{n}$$

$$23) \frac{k^2 - 5k - 6}{5k^2 - 32k + 35} + \frac{1}{5k^2 - 32k + 35} = \frac{1}{5k - 7}$$

$$24) \frac{1}{5p^3 + 7p^2} = \frac{p - 4}{5p^3 + 7p^2} + \frac{3}{p}$$

$$25) \frac{2}{n} = \frac{n^2 - 16n + 64}{n^2 - 5n} + \frac{7}{n^2 - 5n}$$

$$26) \frac{x - 5}{x + 4} + \frac{6x + 30}{x^2 + 10x + 24} = \frac{x - 8}{x + 4}$$

$$27) \frac{x - 5}{2x^2 - 4x} + \frac{x^2 - 6x - 7}{2x^2 - 4x} = \frac{1}{x^2 - 2x}$$

$$28) \frac{n^2 - 25}{n^2 - 11n + 28} + \frac{n^2 + 10n + 16}{n^2 - 11n + 28} = \frac{1}{n - 7}$$

$$29) \frac{1}{k - 1} - \frac{1}{k + 6} = \frac{1}{k^3 + 5k^2 - 6k}$$

$$30) \frac{6}{x^2 + 2x} + \frac{1}{x + 2} = \frac{x}{x + 2}$$

$$31) \frac{m + 4}{m} = \frac{3m^2 + 24m + 36}{5m^2} - \frac{1}{m}$$

$$32) \frac{1}{m - 7} - \frac{m - 5}{m^3 - 7m^2} = \frac{m^2 + 3m + 2}{m^3 - 7m^2}$$

$$33) \frac{1}{p} + \frac{p - 1}{p} = \frac{1}{p^2}$$

$$34) \frac{5}{4a} = \frac{a^2 - 11a + 28}{4a^2 - 8a} - \frac{a + 2}{4a}$$

$$35) \frac{x^2 - 11x + 28}{x^2} + \frac{x^2 + 6x + 8}{4x^2} = \frac{x - 1}{x}$$

$$36) \frac{a - 3}{a + 6} = \frac{a^2 - 5a - 6}{a^2 + 6a} + \frac{3}{a + 6}$$

$$37) \frac{a - 2}{a} = \frac{1}{a^2 - 8a} + \frac{a^2 - 25}{a^2 - 8a}$$

$$38) \frac{3}{r + 5} = \frac{2r - 5}{r - 7} - \frac{5r - 5}{r + 5}$$

$$39) \frac{1}{3v + 24} = \frac{1}{3v} + \frac{v - 6}{3v + 24}$$

$$40) \frac{2m - 3}{m} = \frac{m - 2}{8m - 1} + \frac{3m + 3}{8m^2 - m}$$

$$41) \frac{5}{r^2 + 5r - 6} = \frac{r^2 - 5r - 6}{r^2 + 5r - 6} + \frac{1}{r - 1}$$

$$42) \frac{x^2 + 4x - 5}{x^2 + 12x + 32} = \frac{x + 4}{x + 8} - \frac{1}{x^2 + 12x + 32}$$

$$43) \frac{x - 1}{3} = \frac{1}{3x - 24} + \frac{x^2 - 2x - 15}{3x - 24}$$

$$44) \frac{n^2 + n - 2}{4n^2 + 28n} + \frac{1}{4} = \frac{1}{4n}$$

$$45) \frac{x - 6}{x + 8} = \frac{5}{x^2 + 8x} + \frac{x - 4}{x + 8}$$

$$46) \frac{8}{p^2 - 3p} + \frac{p - 8}{p} = \frac{2}{p^2 - 3p}$$

$$47) \frac{3}{k - 4} - \frac{k - 8}{2} = \frac{1}{2k - 8}$$

$$48) \frac{8}{x} = \frac{x^2 + 4x - 21}{x^2 - x} - \frac{x^2 + x - 12}{x^2 - x}$$

$$49) \frac{n+6}{4} = \frac{1}{16n} + \frac{n+8}{4}$$

$$50) \frac{m-3}{m+8} = \frac{7}{m^2+8m} + \frac{m^2+2m-3}{m^2+8m}$$

$$51) \frac{1}{7a-7} + \frac{8a+24}{7a^3-7a^2} = \frac{a^2+4a+3}{7a^3-7a^2}$$

$$52) \frac{1}{n} + \frac{8n^2-55n-7}{4n^2+8n} = \frac{n-7}{n}$$

$$53) \frac{m+8}{m^2+7m+12} = \frac{m-8}{m+3} - \frac{m^2+m-20}{m^2+7m+12}$$

$$54) \frac{8}{3a^2-18a} + \frac{1}{3a-18} = \frac{a+8}{a}$$

$$55) \frac{1}{p-2} - \frac{p+7}{p-1} = \frac{1}{p^2-3p+2}$$

$$56) \frac{v+3}{v} + \frac{7}{v^2-5v} = \frac{v-1}{v}$$

$$57) \frac{1}{n^2+n} = \frac{n^2-2n-8}{n^2+n} - \frac{n-1}{n}$$

$$58) \frac{x-2}{x^3-5x^2} = \frac{x-2}{x^2} - \frac{5x-30}{x^2}$$

$$59) \frac{x-4}{x} + \frac{1}{x} = \frac{6x+2}{8x-5}$$

$$60) \frac{1}{x-5} = \frac{1}{x^2-11x+30} - \frac{x-7}{x-6}$$

Answers to Difficult (ID: 1)

- | | | | |
|------------------------------------|---------------------------------------|--------------------------------------|--|
| 1) $\{3, -10\}$ | 2) $\{-10\}$ | 3) $\left\{\frac{25}{3}, -3\right\}$ | 4) $\left\{\frac{13}{7}\right\}$ |
| 5) $\{0, -6\}$ | 6) $\{6, -12\}$ | 7) $\left\{\frac{137}{2}\right\}$ | 8) $\left\{-\frac{13}{4}\right\}$ |
| 9) $\{1\}$ | 10) $\{-2\}$ | 11) $\left\{\frac{1}{2}\right\}$ | 12) $\left\{-\frac{5}{4}, -\frac{12}{5}\right\}$ |
| 13) $\{5, -2\}$ | 14) $\{-6, -3\}$ | 15) $\left\{-\frac{2}{3}\right\}$ | 16) $\left\{\frac{3}{2}, \frac{8}{5}\right\}$ |
| 17) $\left\{-\frac{21}{2}\right\}$ | 18) $\{1\}$ | 19) $\{20\}$ | 20) $\{9, 2\}$ |
| 21) $\left\{-\frac{26}{3}\right\}$ | 22) $\{-2, -1\}$ | 23) $\{0, 6\}$ | 24) $\left\{\frac{1}{5}, -\frac{5}{3}\right\}$ |
| 25) $\{9\}$ | 26) $\left\{-\frac{16}{3}\right\}$ | 27) $\{7, -2\}$ | 28) $\left\{\frac{1}{2}, -5\right\}$ |
| 29) $\left\{\frac{1}{7}\right\}$ | 30) $\{3\}$ | 31) $\left\{4, -\frac{9}{2}\right\}$ | 32) $\left\{\frac{3}{4}\right\}$ |
| 33) $\{1, -1\}$ | 34) $\left\{\frac{21}{8}\right\}$ | 35) $\{30, 4\}$ | 36) $\{6\}$ |
| 37) $\{4\}$ | 38) $\{13, 1\}$ | 39) $\{4, 2\}$ | 40) $\left\{\frac{9}{5}\right\}$ |
| 41) $\{5, -1\}$ | 42) $\{-5\}$ | 43) $\left\{\frac{22}{7}\right\}$ | 44) $\left\{1, -\frac{9}{2}\right\}$ |
| 45) $\left\{-\frac{5}{2}\right\}$ | 46) $\{6, 5\}$ | 47) $\{9, 3\}$ | 48) $\left\{-\frac{1}{5}\right\}$ |
| 49) $\left\{-\frac{1}{8}\right\}$ | 50) $\left\{-\frac{4}{5}\right\}$ | 51) $\left\{-\frac{21}{4}\right\}$ | 52) $\left\{3, \frac{19}{4}\right\}$ |
| 53) $\left\{-\frac{10}{3}\right\}$ | 54) $\left\{\frac{19}{3}, -8\right\}$ | 55) $\{-6\}$ | 56) $\left\{\frac{13}{4}\right\}$ |
| 57) $\{-4\}$ | 58) $\left\{6, \frac{23}{4}\right\}$ | 59) $\left\{15, \frac{1}{2}\right\}$ | 60) $\{7, 4\}$ |