

No Calculator. Copy each problem on graph paper and solve showing all work.

Simplify each expression.

$$1) \frac{\frac{9}{x-3}}{\frac{x-3}{x+1}}$$

$$2) \frac{\frac{2}{m+5}}{\frac{1}{2}}$$

$$3) \frac{\frac{x+5}{2} + \frac{4}{x+5}}{\frac{1}{4}}$$

$$4) \frac{\frac{x+3}{5} + \frac{1}{5}}{2x+3}$$

$$5) \frac{\frac{x-2}{4} - \frac{1}{8}}{\frac{x+1}{x-2} + \frac{x-2}{16}}$$

$$6) \frac{\frac{x-2}{3} - \frac{9}{x-2}}{\frac{x+4}{3} + \frac{x-2}{x+4}}$$

Solve each system of equations.

$$7) \begin{cases} x^2 + y^2 - x + 9y - 42 = 0 \\ x - 2y + 3 = 0 \end{cases}$$

$$8) \begin{cases} 5x^2 + 6y^2 - 69x - 2y + 160 = 0 \\ x + 2y + 1 = 0 \end{cases}$$

Convert each degree measure into radians and each radian measure into degrees.

$$9) -\frac{109\pi}{36}$$

$$10) 235^\circ$$

$$11) \frac{17\pi}{6}$$

$$12) -315^\circ$$

Divide.

$$13) (-47n^2 - 45 + 10n^3 + 88n) \div (-7 + 10n)$$

$$14) (35x^3 + 29x^2 + 2x + 48) \div (5x + 7)$$

$$15) (5x^4 - 3x^3 + 33x^2 + 19x - 5) \div (5x + 2)$$

$$16) (-14a + 13 + a^3 + 6a^2) \div (-1 + a)$$

Simplify.

$$17) \frac{\sqrt{2}}{\sqrt{3}}$$

$$18) \frac{5 + \sqrt{5}}{2\sqrt{18}}$$

$$19) \frac{2}{5 - 5\sqrt{2}}$$

$$20) \frac{2 + 5\sqrt{5}}{\sqrt{2} + \sqrt{5}}$$

Simplify each and state the excluded values.

$$21) \frac{6a^2 + 7a - 5}{15a + 25} \div \frac{2a^2 + 9a - 5}{5a + 40}$$

$$22) \frac{7x - 21}{21x^3 + 30x^2} \div \frac{49x + 35}{49x^2 + 105x + 50}$$

$$23) \frac{25n^3 + 45n^2}{15n^2 + 27n - 54} \cdot \frac{54 - 27n - 15n^2}{5n + 9}$$

$$24) \frac{7a^2 - 16a - 15}{35a^3 + 25a^2} \cdot \frac{5a^2}{56a^2}$$

Solve each equation by factoring.

$$25) 6x^2 + 9x - 109 = -4$$

$$26) 14b^2 = 2b$$

$$27) 0 = -384 - 56n^2 - 400n$$

$$28) 48 + 52x = -12x^2$$

Solve each equation by taking square roots.

$$29) 3a^2 + 4 = 7$$

$$30) 100v^2 + 8 = 33$$

Solve each equation with the quadratic formula.

$$31) 3r^2 - 11r - 1 = -11$$

$$32) 6b^2 - 7b - 57 = -8b$$

Solve each equation. Remember to check for extraneous solutions.

$$33) \sqrt{3 - x} = \sqrt{3x - 1}$$

$$34) (8x + 1)^{\frac{1}{2}} = (2x + 3)^{\frac{1}{2}} + 2$$

$$35) p = \sqrt{29 - 2p} + 7$$

$$36) r = (-90 + 19r)^{\frac{1}{2}}$$

$$37) \frac{x+3}{x} + \frac{4}{x+1} = \frac{x^2+2x-15}{x^2+x}$$

$$38) \frac{3}{v^2-v} = 1 + \frac{1}{v^2-v}$$

$$39) 1 = \frac{12x-36}{x^2-x} + \frac{3x-6}{x}$$

$$40) \frac{1}{6n+5} - \frac{n+3}{n} = \frac{1}{6n^2+5n}$$

Solve each equation.

$$41) -27 = -x^{\frac{3}{2}}$$

$$42) n^{\frac{2}{5}} = 4$$

$$43) 64 = (x-18)^{\frac{3}{2}}$$

$$44) b^{\frac{3}{2}} = 8$$

Solve each equation for $0 \leq \theta < 2\pi$. No calculator

$$45) -1 - 11\sin \theta = 3 - 3\sin \theta$$

$$46) -\frac{14}{3} + 3\tan \theta = -5 + \frac{8}{3} \cdot \tan \theta$$

$$47) 2 - 9\tan \theta = -3\sqrt{3} + 2$$

$$48) 2 - \cos \theta = -2 + 3\cos \theta$$

$$49) -3 - 7\sin \theta = 1 + \sin \theta$$

$$50) \frac{20-\sqrt{2}}{5} + 3\cos \theta = 4 + \frac{13}{5} \cdot \cos \theta$$

Factor each.

$$51) x^8 - 18x^4 + 81 = 0$$

$$52) x^8 - 5x^4 + 4 = 0$$

$$53) x^8 - 20x^4 + 64 = 0$$

$$54) x^6 + 3x^4 - 25x^2 - 75 = 0$$

$$55) x^8 - 10x^4 + 9 = 0$$

$$56) x^6 - 64 = 0$$

Evaluate each function.

57) $k(n) = n^2 + \frac{3}{2}$; Find $k\left(\frac{1}{4}\right)$

58) $h(t) = |-2t - 2|$; Find $h\left(\frac{6}{5}\right)$

59) $g(x) = 2^{2x} - \frac{1}{2}$; Find $g(-1)$

60) $k(n) = n^2 + 5n$; Find $k(-3 - n)$

61) $g(x) = 3x^3 + 1$; Find $g(x + 1)$

Solve each equation.

62) $\log_4 (9 - 5x^2) + \log_4 8 = \log_4 62$

63) $\log_4 (x + 17) + \log_4 (x + 5) = 3$

64) $\log_2 5 + \log_2 (4 - 5x^2) = 4$

65) $\log_5 (3x^2 - 6) - \log_5 3 = \log_5 79$

66) Emily and Rob are selling cheesecakes for a school fundraiser. Customers can buy New York style cheesecakes and apple cheesecakes. Emily sold 10 New York style cheesecakes and 4 apple cheesecakes for a total of \$134. Rob sold 5 New York style cheesecakes and 1 apple cheesecake for a total of \$51. What is the cost each of one New York style cheesecake and one apple cheesecake?

67) The sum of the digits of a certain two-digit number is 13. Reversing its digits increases the number by 9. Find the number.

68) The school that Ndiba goes to is selling tickets to a play. On the first day of ticket sales the school sold 3 senior citizen tickets and 13 student tickets for a total of \$207. The school took in \$192 on the second day by selling 3 senior citizen tickets and 12 student tickets. Find the price of a senior citizen ticket and the price of a student ticket.

69) Alberto left the airport and drove toward the mountains at an average speed of 30 km/h. Jose left two hours later and drove in the same direction but with an average speed of 50 km/h. Find the number of hours Alberto drove before Jose caught up.

70) A passenger plane left Los Angeles eight hours before a cargo plane. The planes flew in opposite directions. The cargo plane flew at 190 mph for four hours. After this time the planes were 5320 mi. apart. What was the passenger plane's speed?

Answers to No Calculator. Copy each problem on graph paper and solve showing all work.

1) $\frac{9x+9}{x^2-6x+9}$ 2) $\frac{4}{m+5}$ 3) $\frac{2x^2+20x+66}{x+5}$ 4) $\frac{x+4}{10x+15}$

5) $\frac{4x^2-18x+20}{x^2+12x+20}$ 6) $\frac{x^3-92-39x}{x^3+9x^2-12x-20}$ 7) $(3, 3), (-7, -2)$

8) $(5, -3)$ 9) -545° 10) $\frac{47\pi}{36}$ 11) 510°

12) $-\frac{7\pi}{4}$ 13) $n^2-4n+6-\frac{3}{-7+10n}$ 14) $7x^2-4x+6+\frac{6}{5x+7}$

15) $x^3-x^2+7x+1-\frac{7}{5x+2}$ 16) $a^2+7a-7+\frac{6}{-1+a}$ 17) $\frac{\sqrt{6}}{3}$

18) $\frac{5\sqrt{2}+\sqrt{10}}{12}$ 19) $\frac{-2-2\sqrt{2}}{5}$ 20) $\frac{-2\sqrt{2}+2\sqrt{5}-5\sqrt{10}+25}{3}$

21) $\frac{a+8}{a+5}; \left\{-\frac{5}{3}, -8, \frac{1}{2}, -5\right\}$ 22) $\frac{x-3}{3x^2}; \left\{0, -\frac{10}{7}, -\frac{5}{7}\right\}$ 23) $-5n^2; \left\{\frac{6}{5}, -3, -\frac{9}{5}\right\}$

24) $\frac{a-3}{56a^2}; \left\{0, -\frac{5}{7}\right\}$ 25) $\left\{\frac{7}{2}, -5\right\}$ 26) $\left\{\frac{1}{7}, 0\right\}$ 27) $\left\{-\frac{8}{7}, -6\right\}$

28) $\left\{-\frac{4}{3}, -3\right\}$ 29) $\{1, -1\}$ 30) $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$ 31) $\{2, 1.667\}$

32) $\{3, -3.167\}$ 33) $\{1\}$ 34) $\{3\}$ 35) $\{10\}$

36) $\{9, 10\}$ 37) $\{-3\}$ 38) $\{2, -1\}$ 39) $\{3, -5\}$

40) $\left\{-1, -\frac{8}{3}\right\}$ 41) $\{9\}$ 42) $\{32, -32\}$ 43) $\{34\}$

44) $\{4\}$ 45) $\left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$ 46) $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}\right\}$ 47) $\left\{\frac{\pi}{6}, \frac{7\pi}{6}\right\}$

48) $\{0\}$ 49) $\left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$ 50) $\left\{\frac{\pi}{4}, \frac{7\pi}{4}\right\}$

51) $(x^2-3)^2 \cdot (x^2+3)^2 = 0$ 52) $(x-1)(x+1)(x^2+1)(x^2-2)(x^2+2) = 0$

53) $(x-2)(x+2)(x^2+4)(x^2-2)(x^2+2) = 0$ 54) $(x^2+3)(x^2-5)(x^2+5) = 0$

55) $(x^2-3)(x^2+3)(x-1)(x+1)(x^2+1) = 0$ 56) $(x-2)(x^2+2x+4)(x+2)(x^2-2x+4) = 0$

57) $\frac{25}{16}$ 58) $\frac{22}{5}$ 59) $-\frac{1}{4}$ 60) $-6+n+n^2$

61) $3x^3+9x^2+9x+4$ 62) $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$ 63) $\{-1\}$ 64) $\left\{\frac{2}{5}, -\frac{2}{5}\right\}$

65) $\{9, -9\}$
 66) New York style cheesecake: \$7, apple cheesecake: \$16
 67) 67 68) senior citizen ticket: \$4, student ticket: \$15 69) 5 hours
 70) 380 mph