Ch. 1. Number, Exponents, and Radicals

1. Determine whether each of the following is a perfect square, perfect cube, both or neither.

a) 196 ps b) 81 ps c) 343 pc

2. Determine whether each of the following is a rational or irrational number.

a) $\sqrt{289}$ = 17 R b) square root of 141 = 11.874... Irrational

3. Evaluate using prime factorization. Show all work.

a) $\sqrt{289} = \sqrt{17 \cdot 17} = 17$ b) $\sqrt[3]{5832} = \sqrt[3]{2^3 \cdot 3^3 \cdot 3^3} = 2 \cdot 3 \cdot 3 = 18$

4. Write each expression with **positive** exponents only.

a) $3c^{-4} = \dfrac{3}{c^4}$ b) $\left(\dfrac{4}{7}\right)^{-2} = \left(\dfrac{7}{4}\right)^2$ c) $\dfrac{2^{-3}}{3^{-2}} = \dfrac{3^2}{2^3}$ d) $-5x^{-3}y^{-2} = \dfrac{-5}{x^3y^2}$

5. Simplify each expression. State the answer using **positive** exponents only.

a) $\left[(4)(2^{-3})\right]^{-2} = 4^{-2} \cdot 2^6 = \dfrac{2^6}{4^2}$

b) $(-3m^2n)(-4m^4n^{-2}) = 12m^6n^{-1} = \dfrac{12m^6}{n}$

c) $\left(\dfrac{6mn^3}{4m^2n}\right)^2 = \left(\dfrac{3n^2}{2m}\right)^2 = \dfrac{3^2n^4}{2^2m^2}$

d) $\dfrac{\left(4x^{\frac{1}{3}}\right)^{\frac{1}{2}}(9x)^{-\frac{3}{2}}}{(27x)^{-\frac{1}{3}}} = \dfrac{2x^{\frac{1}{6}} \cdot (27x)^{\frac{1}{3}}}{(9x)^{\frac{3}{2}}} = \dfrac{2x^{\frac{1}{6}}(3x^{\frac{1}{3}})}{27x^{\frac{3}{2}}} = \dfrac{2}{9x}$

e) $\dfrac{\left(q^{-\frac{2}{3}}\right)\left(q^{\frac{1}{3}}\right)}{q^{\frac{4}{3}}} = q^{-\frac{2}{3}+\frac{1}{3}-\frac{4}{3}} = q^{-\frac{5}{3}} = \dfrac{1}{q^{\frac{5}{3}}}$

Ch. 2 Trigonometry: *SOH-CAH-TOA*

1. Evaluate the following to the nearest hundredth.

a) tan 72° = 3.08 b) sin 42° = 0.67 c) cos 68° = 0.37

d) tan A = 2.580 A = 68.81°

e) sin A = 0.4384 A = 26.00°

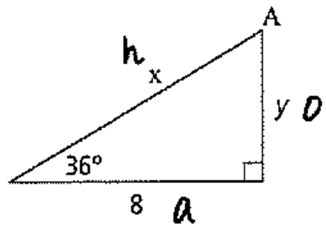
f) cos A = 0.2079 A = 78.00°

2. Find the unknown values to the nearest hundredth.

∠A = 54°

x = 9.89

y = 5.81



$\tan 36° = \dfrac{y}{8}$

$y = 8 \cdot \tan 36° = 5.81234\ldots$

$\angle A = 180 - 90 - 36° = 54°$

$\cos 36° = \dfrac{8}{h}$

$h = \dfrac{8}{\cos 36°} = 9.8885\ldots$

$90^\circ - \angle A = 61.446\ldots$

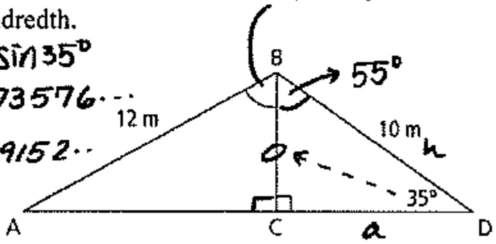
3. Solve the following angles and lengths to the nearest hundredth.

$\angle ABC =$ 61.45° $\quad \sin 35^\circ = \frac{BC}{10}$ $\quad BC = 10 \cdot \sin 35^\circ = 5.73576\ldots$

$\angle A =$ 28.55° $\quad \cos 35^\circ = \frac{CD}{10}$ $\quad CD = 8.19152\ldots$

BC = 5.74 $\quad AC = \sqrt{12^2 - BC^2} = 10.540\ldots$

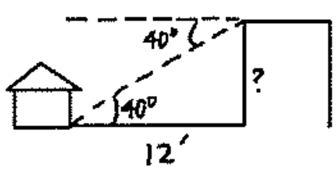
AD= 18.73 $\quad AD = CD + AC = 18.73197\ldots$



$\cos A = \frac{AC}{12}$

$A = \cos^{-1}\left(\frac{AC}{12}\right) = 28.5535\ldots$

4. There is a building that is 12 feet away from the house. What is the height of the building if the angle of depression to the bottom of the house is 40°.



$\tan 40^\circ = \frac{?}{12}$

$? = 12 \cdot \tan 40^\circ = 10.069\ldots$ feet

$= 10.07$ feet

Ch. 3 and 4. Polynomials and Factoring

1. Expand and simplify as much as possible. Order the terms correctly.

a) $(x - 3)(2x + 1)$

$= 2x^2 + x - 6x - 3$

$= 2x^2 - 5x - 3$

b) $(5m - 1)(2m - 3)$

$= 10m^2 - 15m - 2m + 3$

$= 10m^2 - 17m + 3$

c) $(x + 2)(2x^2 - 5x + 1)$

$= 2x^3 - 5x^2 + x + 4x^2 - 10x + 2$

$= 2x^3 - x^2 - 9x + 2$

d) $(x + 14)(x - 14)$

$= x^2 - 196$

e) $(y + 10)^2$

$= y^2 + 20y + 100$

f) $(8 - m)^2$

$= 64 - 16m + m^2$

$= m^2 - 16m + 64$

2. Factor the polynomials. Write NF if not factorable.

a) $15x^2 + 10x^2$ $= 25x^2$ NF

b) $7a^3b - 28ab + 14ab^3$ $\quad$ GCF $= 7ab$

$= 7ab(a^2 - 4 + 2b^2)$

c) $3x(x - 4) + 5(x - 4)$ $\quad$ GCF $= (x - 4)$

$= (x - 4)(3x + 5)$

d) $y^2 + 8xy + 2y + 16x$

NF

e) $x^2 + \overset{S}{4}x + \overset{P}{6}$

NF

P (+6)	S (+4)
1, 6	X
2, 3	X

f) $x^2 - 29x + 28$

P (+28)	S (−29)
−1 −28	☺

$(x-1)(x-28)$

2. Factor.

a) $x^2 - 9 = (x-3)(x+3)$

b) $25a^2 - 16c^2 = (5a-4c)(5a+4c)$

$4c\ 4c$

$5a\ 5a$

c) $x^2 - 6x + 9 = (x-3)^2$

$3\ 3$

d) $2x^2 - 44x + 242$

$= 2(x^2 - 22x + 121)$

$= 2(x-11)^2$

e) $16x^2 - 4y^2 = (4x-2y)(4x+2y)$

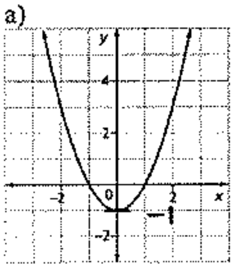
f) $9x^3 - 36x = x(9x^2 - 36)$

$= x(3x+6)(3x-6)$

Ch. 5, 6, and 7. Relations and Functions

1. Use the set notation to write the domain and range of each relation.

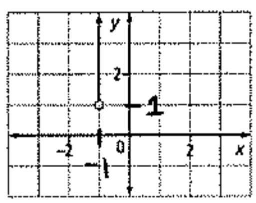
a)



Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq -1\}$

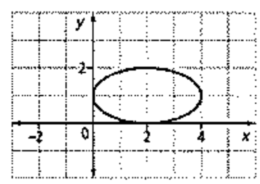
b)



Domain: $\{x \mid x = -1\}$

Range: $\{y \mid y > 1\}$

c)



Domain: $\{x \mid 0 \leq x \leq 4\}$

Range: $\{y \mid 0 \leq y \leq 2\}$

2. For the function $f(x) = 3x + 7$, evaluate

a) $f\left(\frac{1}{3}\right) = 3\left(\frac{1}{3}\right) + 7 = 8$

b) $f(-2) = 3(-2) + 7$

$= +1$

c) x if $f(x) = 34 = 3x + 7$

$3x = 27$

$x = 9$

3. For the function $g(x) = \frac{1}{4}x + \frac{3}{4}$, evaluate

a) $g(5) = \frac{1}{4}(5) + \frac{3}{4}$

$= \frac{5}{4} + \frac{3}{4} = \frac{8}{4} = 2$

b) $g(-3) = \frac{1}{4}(-3) + \frac{3}{4}$

$= 0$

c) x if $g(x) = -\frac{3}{2} = \frac{1}{4}x + \frac{3}{4}$

$\frac{1}{4}x = -\frac{3}{2} - \frac{3}{4}$

$\frac{1}{4}x = -\frac{9}{4}$

$x = -9$

4. Use the slope formula to determine the slope of the line passing through each pair of points.

a) A(2, –1), B(3, 4) b) C(0, 7), D(–3, 7) c) G(4, –2), H(4, –5)

$m = \frac{4+1}{3-2} = 5$

$m = \frac{7-7}{-3-0} =$ zero

$m = \frac{-5+2}{4-4} =$ undefined

5. Use the midpoint formula to determine the midpoint of the line passing through each pair of endpoints.

a) A(2, –1), B(3, 4) b) C(0, 7), D(–3, 7) c) G(4, –2), H(4, –5)

$M = \left(\frac{2+3}{2}, \frac{-1+4}{2}\right)$

$= (2.5, 1.5)$

$M = \left(\frac{0-3}{2}, \frac{7+7}{2}\right)$

$= (-1.5, 7)$

$M = \left(\frac{4+4}{2}, \frac{-2-5}{2}\right)$

$= (4, -3.5)$

6. Use the distance formula to determine the length of the line passing through each pair of endpoints.

a) A(2, –1), B(3, 4) b) C(0, 7), D(–3, 7) c) G(4, –2), H(4, –5)

$= \sqrt{(4+1)^2 + (3-2)^2}$

$= \sqrt{25+1} = \sqrt{26}$

$= \sqrt{(7-7)^2 + (-3)^2}$

$= \sqrt{0+9} = 3$

$= \sqrt{(-5+2)^2 + (4-4)^2}$

$= \sqrt{9} = 3$

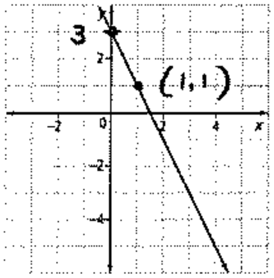
Ch. 8. Linear Equations and Graphs

1. Determine the equation of each line in three different forms.

a)

$b=3$

$m=-\frac{2}{1}$



$y=-2x+3$

$2x+y-3=0$

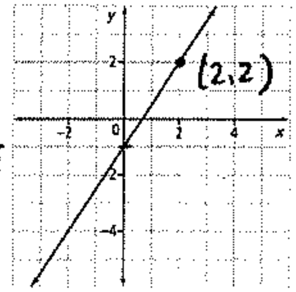
using (1,1)

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

b)

$b=-1$

$m=\frac{3}{2}$



$y=\frac{3}{2}x-1$

$3x-2y-1=0$

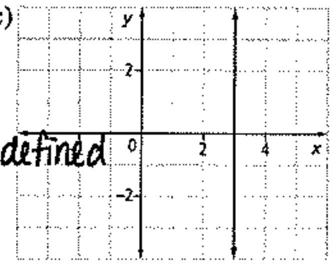
using (2,2)

$y-2=\frac{3}{2}(x-2)$

c)

$b\neq$

m=undefined



$x=3$

$x-3=0$

No point slope form b/c m DNE.

2. Determine the slope and y-intercept of each line.

a) $4x+2y=12$

$2y=-4x+12$

$b=6 \quad m=-2$

b) $3x-2y-600=0$

$2y=3x-600$

$b=-300 \quad m=\frac{3}{2}$

3. Given the equation $y=4x+b$, and a point on the graph of a line, find b.

a) (2, 4)

$4=4(2)+b$

$b=4-8=-4$

b) (−3, 7)

$7=4(-3)+b$

$b=7+12=19$

4. Convert slope-intercept form to the General Form Ax+By+C=0.

a) $y=-\frac{2}{3}x+6$

$3y=-2x+18$

$2x+3y-18=0$

b) $y=\frac{3}{4}x-2$

$4y=3x-8$

$3x-4y-8=0$

5. Given the following equation, find the x-intercept and y-intercept. Then graph on a separate graphing paper.

$4x-6y-12=0$

$6y=4x-12$

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

must have

$b=-2$

$m=\frac{2}{3}\frac{\text{Rise}}{\text{Run}}$

6. Write the equation of a line in y=mx+b, given a point on the line and the slope, m.

a) Given (−2, 5) and slope = m= −3

x y

$5=-3(-2)+b$

$b=5+6=11$

$y=-3x+11$

b) Given (3,−4) and slope = m= 2

$-4=2(3)+b$

$b=-4-6=-10$

$y=2x-10$

7. State whether the lines in each pair are parallel, perpendicular or neither. Then determine the number of solution for each system.

a) $y = 4x + 3$
$y = 4x - 5$

same

// lines

b) $y = 3x - 6$
$y = -2/3x + 4$

Neither

c) $y = 2x + 6$
$6x + 3y + 3 = 0$

$3y = -6x - 3$
$y = -2x - 1$

Neither

8. Write an equation in y=mx + b that is perpendicular to $y = 3x - 4$ and passes through a point (6, 5).

$\perp m = -\frac{1}{3}$

$y - 5 = -\frac{1}{3}(x - 6)$

change to $y = mx + b$

$y - 5 = -\frac{1}{3}x + 2$
$y = -\frac{1}{3}x + 7$

9. Write an equation in y=mx + b that is perpendicular to $2x - y + 4 = 0$ and passes through a point (1,-6).

$\perp m = -\frac{1}{2}$ $y = 2x + 4$

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

$y + 6 = -\frac{1}{2}x + \frac{1}{2}$
$y = -\frac{1}{2}x - \frac{11}{2}$

Ch. 9. Systems of Linear Equations

1. Is the given point a solution to the system of linear equations? Justify your answer.

a) ① $y = 5x + 13$ (4, 7)
② $y = -7x - 35$

verify w/ ① $7 \overset{?}{=} 5(4) + 13$ NO!

b) Ⓐ $4x - 5y = 20$ (–5, –8)
Ⓑ $x + 3y = -29$

Ⓐ $4(-5) - 5(-8) \overset{?}{=} 20$
$-20 + 40 = 20$ yes!
Ⓑ $-5 + 3(-8) \overset{?}{=} -29$ yes!

2. In the system of linear equations $y = 8x + 5$ and $y = 8x + b$, what values of b will result in a system that has

a) no solution? ⇒ // line = same m w/ different b.

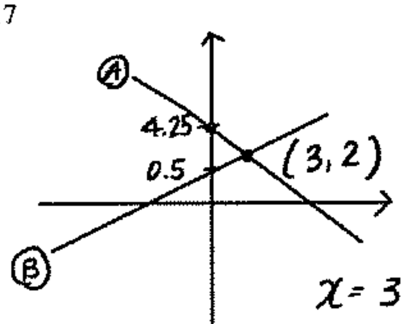
∴ choose any b other than 5

b) an infinite number of solutions? ⇒ same line = same m and b

∴ b = 5

3. Graph the system of linear equations on a separate graphing paper to solve the system.

Ⓐ $3x + 4y = 17$
Ⓑ $x - 2y = -1$



$x = 3$
$y = 2$

$3x + 4y = 17$
$4y = -3x + 17$
$y = \frac{-3}{4}x + \frac{17}{4}$

$x - 2y = -1$
$2y = x + 1$
$y = \frac{1}{2}x + \frac{1}{2}$

4. Solve the system using either substitution or elimination method.

a) $y = -5x - 8$

$- \quad y = 4x + 1$

$0 = -9x - 9$

$9x = -9$

$x = -1$

$y = -5(-1) - 8$

$y = -3$

b) $x + y = 9$

$-10x + 6y = 6$

$+ \quad 10x + 10y = 90$

$0 + 16y = 96$

$y = 6$

$x + 6 = 9$

$x = 3$

c) $\frac{x}{2} + \frac{y}{3} = 6 \quad \times 6$

$3x - 2y = 12$

$+ \quad 3x + 2y = 36$

$6x = 48$

$x = 8$

$3(8) - 2y = 12$

$-2y = -12$

$y = 6$

d) $5 = 6x + 2y$

$2y = x + 5$

$\Downarrow$ Realign

$6x + 2y = 5$

$- \quad -x + 2y = 5$

$5x = 0$

$x = 0$

$2y = 0 + 5$

$2y = 5$

$y = \frac{5}{2}$

e) $3x + 2y = 0 \quad \times 8$

$8x + 7y = 5 \quad \times 3$

$24x + 16y = 0$

$- \quad 24x + 21y = 15$

$-5y = -15$

$y = 3$

$3x + 2(3) = 0$

$3x = -6$

$x = -2$

f) $\frac{1}{2}x - \frac{3}{2}y = -4$

$x + 7y = 12$

$\times 2$

$x - 3y = -8$

$x = 3y - 8$

Sub. $3y - 8 + 7y = 12$

$10y = 20$

$y = 2$

$x = 3(2) - 8$

$x = -2$

Ch. 10. Arithmetic Sequence

1. Determine whether each sequences is an arithmetic sequence or not.

a. $0, 2, 5, 9, 14, \ldots$

$+2 \quad +3$ No!

b. $37, 34, 31, 28, \ldots$

$-3 \quad -3 \quad -3$ yes!

c. $-\frac{1}{3}, -\frac{17}{6}, -\frac{16}{3}, \ldots$

$-\frac{5}{2} \quad -\frac{5}{2}$ yes!

2. Find the t_{100} of each arithmetic sequence.

a. $10, 13, 16, 19, \ldots$

$a = 10 \quad d = 3$

$t_{100} = 10 + (100-1)3$

$= 10 + 297 = 307$

b. $-14, -19, -24, \ldots$

$a = -14 \quad d = -5$

$t_{100} = -14 + (99)(-5)$

$= -509$

c. $\frac{3}{5}, \frac{7}{10}, \frac{4}{5}, \ldots$

$a = \frac{3}{5} \quad d = \frac{1}{10}$

$t_{100} = \frac{3}{5} + (99)(\frac{1}{10})$

$= \frac{3}{5} + \frac{99}{10} = \frac{6}{10} + \frac{99}{10} = \frac{105}{10} = \frac{21}{2}$

3. An arithmetic sequence has a common difference of -4 and its 37^{th} term is 10. Find the first term.

$d = -4 \quad t_{37} = 10 = a + (37-1)(-4)$

$10 = a - 144$

$a = 154$

4. How many terms are there in the following sequence?

$7, 10, 13, \ldots, 391, 394$

$a = 7 \quad d = 3 \quad t_n = 394 = 7 + (n-1)(3)$

$394 = 7 + 3n - 3$

$3n = 390$

$n = 130$ terms

5. Ms. Yajima's 100 meter dash times for her first four races were 14 seconds, 13.4 seconds, 12.8 seconds, and 12.2 seconds.

i)Assuming race times will decrease at the same rate for the subsequent race. Write the general term t_n.

$a = 14$

$d = -0.6$

$t_n = 14 + (n-1)(-0.6)$

$t_n = 14 - 0.6n + 0.6 \rightarrow t_n = -0.6n + 14.6$

ii)What will be the time for her 12^{th} race?

$t_{12} = -0.6(12) + 14.6 = 7.4$ seconds!

iii)At which race will she have a time of 11 seconds for the 100 meter dash?

$t_n = 11 = -0.6n + 14.6$

$0.6n = 3.6$

$n = 6^{th}$ race