ALGEBRAIC FORMULAS

Slope The slope of a line, m, containing points (x_1, y_1) and (x_2, y_2):

$$m = \frac{y_2 - y_1}{x_2 - x_1}, \text{ in which } x_1 \neq x_2$$

Slope-Intercept Form The equation of a line with slope m and y-intercept $(0, b)$:

$$y = mx + b$$

Point-Slope Form The equation of a line with slope m and point (x_1, y_1):

$$y - y_1 = m(x - x_1)$$

Perfect Square Trinomial $a^2 + 2ab + b^2 = (a + b)^2$

Perfect Square Trinomial $a^2 - 2ab + b^2 = (a - b)^2$

Difference of Two Squares $a^2 - b^2 = (a + b)(a - b)$

Sum of Two Squares $a^2 + b^2$ cannot be factored.

Difference of Two Cubes $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Sum of Two Cubes $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Quadratic Formula If $ax^2 + bx + c = 0$, and $a \neq 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

GEOMETRIC FORMULAS

Pythagorean Theorem In any right triangle, with c as the hypotenuse, $a^2 + b^2 = c^2$

Sum of Angles of Triangles In any triangle, the sum of the measures of the three angles is 180°.

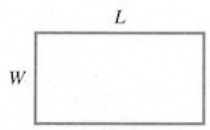
Distance The distance between points (x_1, y_1) and (x_2, y_2) can be found by using the formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Perimeter and Circumference

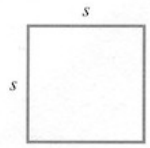
1. Rectangle

$P = 2L + 2W$



2. Square

$P = 4s$

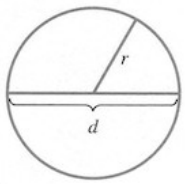


3. Circle

$C = \pi d$

$C = 2\pi r$

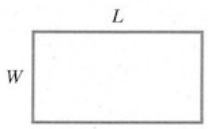
$(\pi \approx 3.14)$



Area

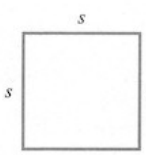
4. Rectangle

$A = L \cdot W$



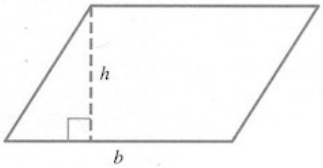
5. Square

$A = s^2$



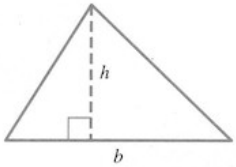
6. Parallelogram

$A = b \cdot h$



7. Triangle

$A = \dfrac{1}{2} \cdot b \cdot h$



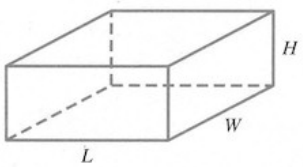
8. Circle

$A = \pi r^2$

Volume

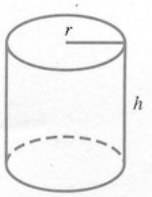
9. Rectangular Solid

$V = L \cdot W \cdot H$

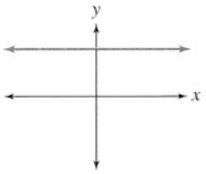


10. Cylinder

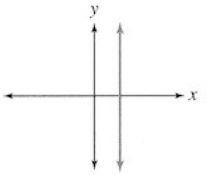
$V = \pi r^2 h$



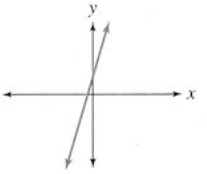
COMMON GRAPHS



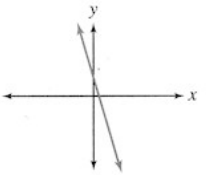
Horizontal line:
Slope is zero
$y = c$



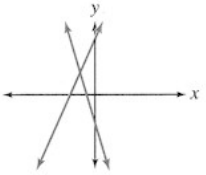
Vertical line:
Slope is undefined
$x = d$



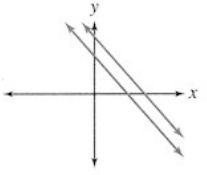
Linear function:
Slope is positive
$y = mx + b; m > 0$



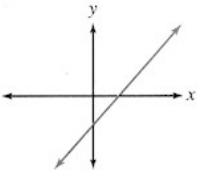
Linear function:
Slope is negative
$y = mx + b; m < 0$



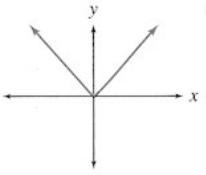
Two lines intersect:
independent and
consistent; one solution



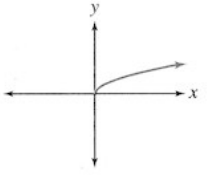
Two parallel lines:
independent and
inconsistent; no solution



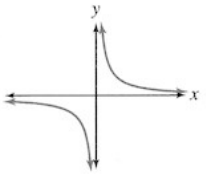
One single line:
dependent and consistent;
infinitely many solutions



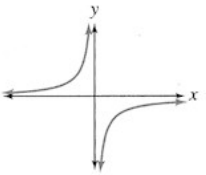
Absolute value
function: $y = |x|$



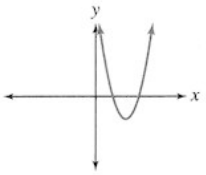
Square root function:
$y = \sqrt{x}; x > 0$



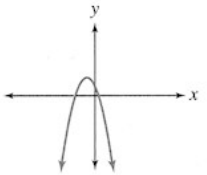
Rational function:
$y = \dfrac{a}{x}; a > 0$



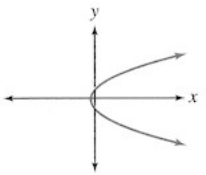
Rational function:
$y = \dfrac{a}{x}; a < 0$



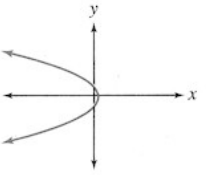
Quadratic function:
$y = a(x - h)^2 + k$
Opens up if $a > 0$
Vertex at (h, k)



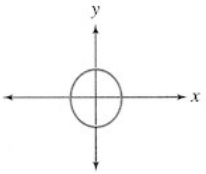
Quadratic function:
$y = a(x - h)^2 + k$
Opens down if $a < 0$
Vertex at (h, k)



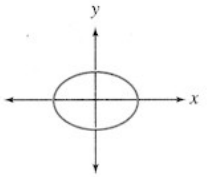
Quadratic function:
$x = a(y - h)^2 + k$
Opens right if $a > 0$
Vertex at (h, k)



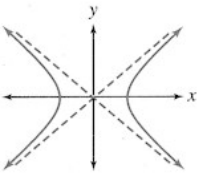
Quadratic function:
$x = a(y - h)^2 + k$
Opens left if $a < 0$
Vertex at (h, k)



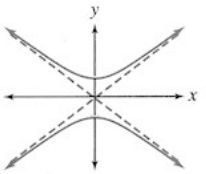
Circle:
$(x - h)^2 + (y - k)^2 = r^2$
Center at (h, k)
Radius is r



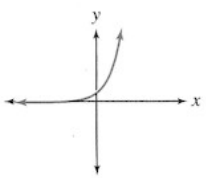
Ellipse:
$\dfrac{(x - h)^2}{a^2} + \dfrac{(y - k)^2}{b^2} = 1$
(where $a \neq b$;
$a > 0; b > 0$)
Center at (h, k)



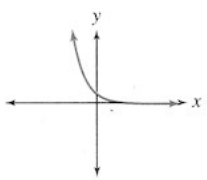
Horizontal hyperbola:
$\dfrac{(x - h)^2}{a^2} - \dfrac{(y - k)^2}{b^2} = 1$
$(a > 0; b > 0)$
Center at (h, k)



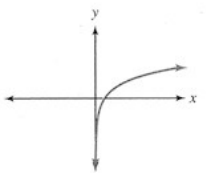
Vertical hyperbola:
$\dfrac{(y - k)^2}{b^2} - \dfrac{(x - h)^2}{a^2} = 1$
$(a > 0; b > 0)$
Center at (h, k)



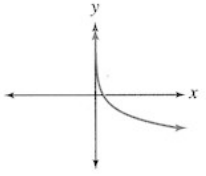
Exponential function:
$y = b^x; b > 1$



Exponential function:
$y = b^x; 0 < b < 1$



Logarithmic function:
$y = \log_b x; b > 1$



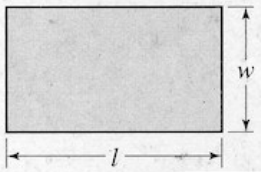
Logarithmic function:
$y = \log_b x; 0 < b < 1$

Geometric Formulas

RECTANGLE

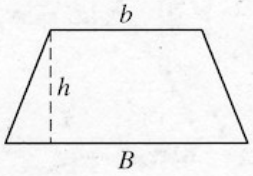
Perimeter $P = 2l + 2w$

Area $A = lw$



TRAPEZOID

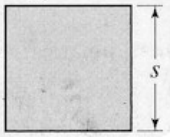
Area $A = \frac{1}{2}h(B + b)$



SQUARE

Perimeter $P = 4s$

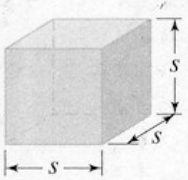
Area $A = s^2$



CUBE

Surface area $S = 6s^2$

Volume $V = s^3$



CIRCLE

Perimeter $P = 2\pi r$

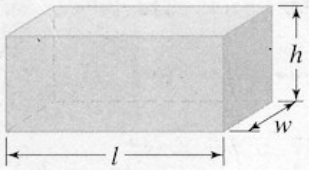
Area $A = \pi r^2$

where $\pi \approx 3.14$ or $\frac{22}{7}$

RECTANGULAR SOLID

Surface area $S = 2wh + 2lh + 2lw$

Volume $V = lwh$

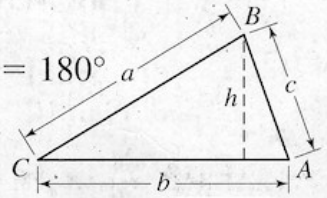


TRIANGLE

Perimeter $P = a + b + c$

Area $A = \frac{1}{2}bh$

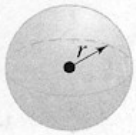
$m\angle A + m\angle B + m\angle C = 180°$



SPHERE

Surface area $S = 4\pi r^2$

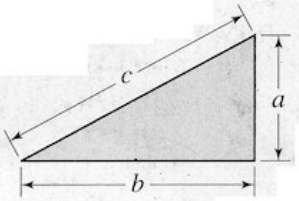
Volume $V = \frac{4}{3}\pi r^3$



RIGHT TRIANGLE

Pythagorean theorem

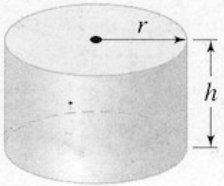
$a^2 + b^2 = c^2$



RIGHT CIRCULAR CYLINDER

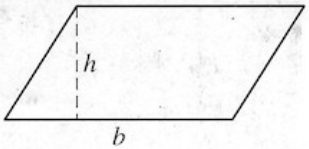
Surface area $S = 2\pi r^2 + 2\pi rh$

Volume $V = \pi r^2 h$



PARALLELOGRAM

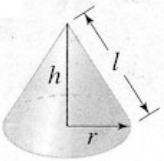
Area $A = bh$



RIGHT CIRCULAR CONE

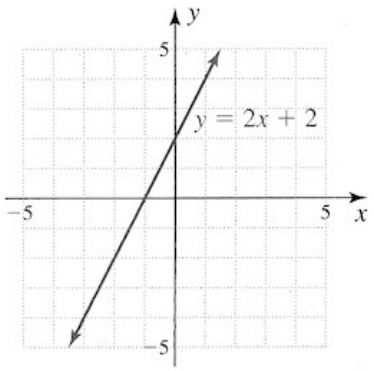
Surface area $S = \pi rl + \pi r^2$

Volume $V = \frac{1}{3}\pi r^2 h$

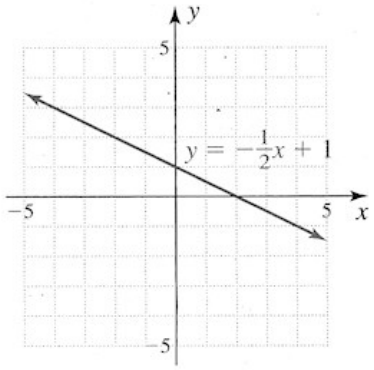


SLOPE OF A LINE

$$m = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}} = \frac{y_2 - y_1}{x_2 - x_1}, \quad x_2 \neq x_1$$



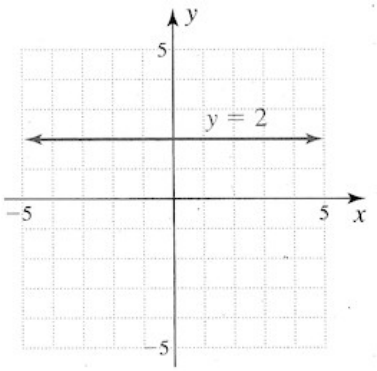
Linear function
positive slope



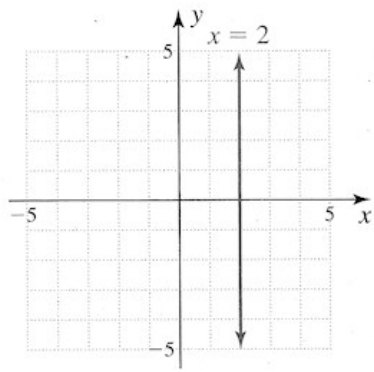
Linear function
negative slope

LINEAR EQUATIONS

General form	$ax + by = c$
Point-slope form	$y - y_1 = m(x - x_1)$
Slope-intercept form	$y = mx + b$



Horizontal line
y = constant;
slope = 0



Vertical line
x = constant;
slope undefined

ABSOLUTE-VALUE EQUATION AND INEQUALITY FORMULAS

If $c > 0$, then:

$|x| = c$ means $x = c$ or $x = -c$

$|x| \leq c$ means $-c \leq x \leq c$

$|x| \geq c$ means $x \leq -c$ or $x \geq c$

PROPERTIES OF EXPONENTS

If a and b are real numbers, and m and n are integers, the following rules hold.

Product rule	$b^m \cdot b^n = b^{m+n}$
Power rules	$(b^m)^n = b^{mn}$
	$(ab)^m = a^m b^m$
	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, \quad b \neq 0$
Quotient rule	$\frac{b^m}{b^n} = b^{m-n}, \quad b \neq 0$
Negative exponents	$b^{-n} = \frac{1}{b^n}, \quad b \neq 0$
Zero as an exponent	$b^0 = 1, \quad b \neq 0$

PROPERTIES OF RADICALS

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b} \qquad \sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$b^{m/n} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$$

QUADRATIC FORMULA

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

for $ax^2 + bx + c = 0, \quad a \neq 0$

Discriminant $= b^2 - 4ac$

DISTANCE FORMULA

Between points (x_1, y_1) and (x_2, y_2)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

SPECIAL PRODUCTS AND FACTORS

$(a + b)^2 = a^2 + 2ab + b^2$

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

$a^2 - b^2 = (a + b)(a - b)$

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$