

What students need to know for...
PRECALCULUS 2018-2019

NAME: _____

This is a **MANDATORY** assignment that will be **GRADED**. It is due the first day of the course. Your teacher will determine how it will be counted (i.e. homework, quiz, etc.)

Students expecting to take Precalculus at Cambridge Rindge and Latin High School should demonstrate the ability to...

General:

- keep an organized notebook
- take good notes
- complete homework every night
- be active learners
 - ask questions and participate in class
 - seek help outside of class if needed
- work with others
- work with and without a calculator

Specific Math Skills

1) Tools of Algebra

- define and use basic concepts and properties of real numbers, operations, and equalities.
- solve and graph one-variable equations with/without absolute value.

2) Linear Relationships and Functions

- define and specify relations and functions by verbal descriptions, lists, and tables
- determine equations for specific functions and relations
- recognize slope as rate of change of one variable in terms of another
- write and interpret a direct variation.

3) Quadratic Equalities and Functions

- write quadratic functions in standard form
- graph quadratic functions to get parabolas
- identify axis of symmetry, intercepts and vertices of parabolas
- solve expressions with radicals
- solve quadratic equations by factoring, finding square roots, graphing, completing the square, quadratic formula
- identify and graph complex numbers
- add, subtract, multiply and divide complex numbers

4) Radical Functions and Rational Exponents

- add, subtract, multiply and divide radical expressions
- rationalize denominators
- simplify expressions with rational exponents
- add, subtract, multiply and divide functions

5) Exponential and Logarithmic Functions

- graph exponential functions
- solve exponential and logarithmic equations

Review Problems:

*NOTE: Show all of your work. Your teacher may count this as a quiz grade, a homework grade, or they may give a quiz on this material at the beginning of the year. The first question of each topic is answered for you. You should “Google” the topic if you are unsure how to complete the examples.

Khanacademy.org and Vimeo.com/rbenson have some good instructional videos. Good luck!

- The CRLS Math Department

SKILL 1: Tools of Algebra

Solve each formula for the indicated variable:

a) $A = \frac{1}{2}bh$, for h

Answer: $A = \frac{1}{2}bh$

Original equation

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

Multiply both sides with 2 to clear the fraction

$$2A = bh$$

Simplify

$$\frac{2A}{b} = \frac{bh}{b}$$

Divide both sides by b

$$\frac{2A}{b} = h$$

Simplify

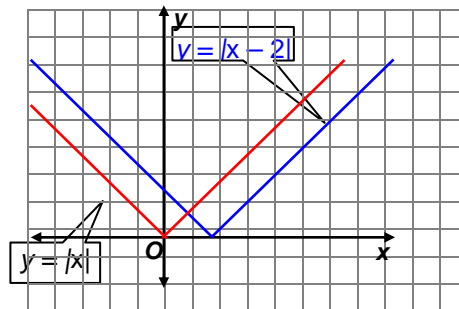
b) $V = \pi r^2 h$, for h

c) $V = s^2 + \frac{1}{2}sh$, for h

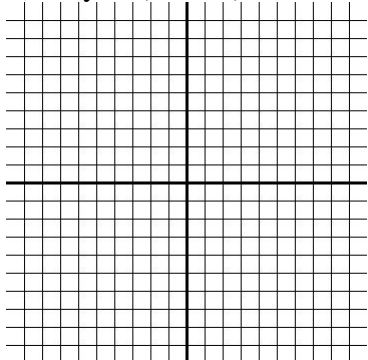
SKILL 2: Linear Relationships and Functions

Describe the translation in each case then graph the function.

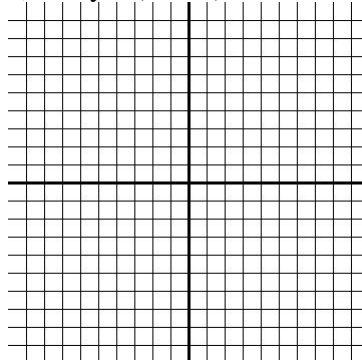
a) $y = |x - 2|$. Answer: The graph of $y = |x - 2|$ is a translation of the graph of $y = |x|$ moved right 2 units.



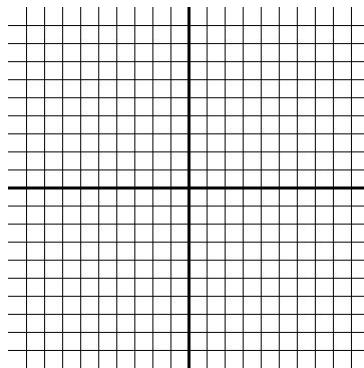
b) $y = -|x + 6|$



c) $y = |5 - x| + 3$



d) $y = 2|x + 3| - 8$



SKILL 3: Quadratic Equalities and Functions

Solve each equation by factoring.

a) $5x^3 - 30x^2 = 0$

Answer: $5x^3 - 30x^2 = 5x^2(x) - 5x^2(6) = 0$
 $= 5x^2(x - 6) = 0$

Factor the GCF.
Distributive Property

$5x^2 = 0$ or $x - 6 = 0$
 $x = 0$ or $x = 6$

Set each factor equal 0
Solve each equation

b) $3x^2 - 6x - 4 + 2x = 0$

c) $x^2 + 6x + 8 = 0$

d) $3x^2 = 16x + 12$

Solve each Equation using Quadratic Formula

a) $2x^2 - x = 15$

Answer:

First, write the equation in the form $ax^2 + bx + c = 0$ and identify a , b , and c .

$$ax^2 + bx + c = 0$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$2x^2 - x = 15 \rightarrow 2x^2 - 1x - 15 = 0$$

Then, substitute these values into the Quadratic Formula.

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

Quadratic Formula

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-15)}}{2(2)}$$

Replace a with 2, b with -1 , and c with -15 .

$$x = \frac{1 \pm \sqrt{1 + 120}}{4}$$

Simplify.

$$x = \frac{1 \pm \sqrt{121}}{4}$$

Simplify.

$$x = \frac{1 \pm 11}{4}$$

$$\sqrt{121} = 11$$

$$x = \frac{1+11}{4} \quad \text{or} \quad x = \frac{1-11}{4}$$

Write as two equations.

$$= 3$$

$$= -2.5$$

Simplify.

The solutions are -2.5 and 3 . Check by substituting each of these values into the original equation.

b) $x^2 - 4x + 3 = 0$

Simplify each Complex expression:

a) $(-7 + 5i) + (12 + 3i)$

Answer:

$$\begin{aligned} &(-7 + 5i) + (12 + 3i) \\ &= (-7 + 12) + (5 + 3)i \\ &= 5 + 8i \end{aligned}$$

Commutative and Associative Properties
Simplify.

b) $(2 + 4i) + (4 - 2i)$

c) $(3 + \sqrt{-4})(4 + \sqrt{-1})$

SKILL 4: Radical Functions and Rational Exponents

Simplify each radical expression:

a) $\sqrt{72m^7}$

Answer:

$$\begin{aligned} \sqrt{72m^7} &= \sqrt{2 \cdot 6^2 \cdot (m^3)^2 \cdot m} \\ &= \sqrt{2} \cdot \sqrt{6^2} \cdot \sqrt{(m^3)^2} \cdot \sqrt{m} \\ &= 6m^3 \sqrt{2m} \end{aligned}$$

Factor into squares where possible.

Product Property of Radicals

Simplify.

b) $\sqrt{36} = \underline{\hspace{2cm}}$ $-\sqrt{36} = \underline{\hspace{2cm}}$ $\sqrt{-36} = \underline{\hspace{2cm}}$ $-\sqrt[4]{81} = \underline{\hspace{2cm}}$

c) $\sqrt{16x^2} = \underline{\hspace{2cm}}$ $\sqrt{x^8 y^{18}} = \underline{\hspace{2cm}}$ $\sqrt[3]{x^8 y^{12}} = \underline{\hspace{2cm}}$

Solve each equation. Include ALL solutions for x.

a) $3\sqrt{x} + 3 = 15$

b) $(x + 5)^{\frac{2}{3}} = 4$

c) $\sqrt{x + 7} - x = 1$

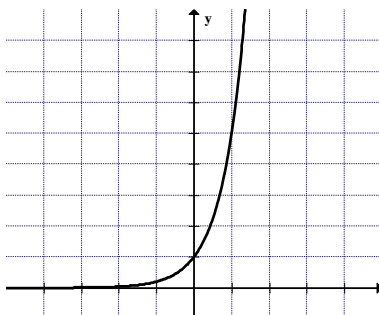
SKILL 5: Exponential and Logarithmic Functions

Graph each exponential function. Find the y-intercept, and state the domain and range.

a) $y = 5^x$.

Answer:

x	5^x	y
-2	5^{-2}	$\frac{1}{25}$
-1	5^{-1}	$\frac{1}{5}$
0	5^0	1
1	5^1	5
2	5^2	25
3	5^3	125

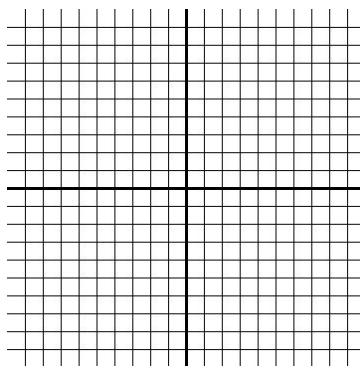


Graph the ordered pairs, and connect the points with a smooth curve.

The graph crosses the y-axis at 1, so the y-intercept is 1.

The domain is all real numbers, and the range is all positive real numbers

b) $y = \left(\frac{1}{4}\right)^x$.



Solve each exponential function

a) $\left(\frac{1}{2}\right)^{n-1} = 16$

Answer:

$$\left(\frac{1}{2}\right)^{n-1} = 16 \quad \text{Original equation}$$

$$(2^{-1})^{n-1} = 2^4 \quad \text{Rewrite } \frac{1}{2} \text{ as } 2^{-1} \text{ and } 16 \text{ as } 2^4 \text{ so each side as the same base.}$$

$$2^{-n+1} = 2^4 \quad \text{Power of a Power}$$

$$-n + 1 = 4 \quad \text{Property of Equality for Exponential Functions}$$

$$-n = 3 \quad \text{Subtract 1 from each side.}$$

$$n = -3 \quad \text{Divide each side by } -1.$$

b) $5^{5n+1} = 125^{n-2}$

Solve each Logarithmic Equation

a) $\log_{\frac{1}{8}} a = \frac{2}{3}$

Answer: $\log_{\frac{1}{8}} a = \frac{2}{3}$ Original equation

$$a = \left(\frac{1}{8}\right)^{\frac{2}{3}} \quad \text{Definition of logarithm}$$

$$a = \left[\left(\frac{1}{2}\right)^3\right]^{\frac{2}{3}} \quad \frac{1}{8} = \left(\frac{1}{2}\right)^3$$

$$a = \left(\frac{1}{2}\right)^2 \quad \text{or } \frac{1}{4} \quad \text{Power of a Power}$$

b) $\log_6 (a^2 - 15) = \log_6 (2a)$