

# Skills from previous math classes that you need to self-review for Math 1A

## From Algebra:

### Numeracy

What is  $0 \div 1$  ?  $1 \div 0$  ?  $0 \div 0$  ?

What happens when you add/subtract/multiply/divide a number very close to 0 and a number very close to 0 ?

What happens when you add/subtract/multiply/divide a number very close to 1 and a number very close to 0 ?

What happens when you add/subtract/multiply/divide a number very close to 0 and a very large number ?

What happens when you add/subtract/multiply/divide a very large number and another very large number ?

### Equations of lines (slope-point form)

### Absolute value inequalities

### Quadratic functions

Graphing

Factoring

Quadratic formula

Completing the square

### Negative and fractional exponents

### Radical expressions

Rationalizing denominators

### Rational expressions

Add / subtract

Polynomial long division

Simplifying complex fractions (quotients involving quotients)

Asymptotes of rational functions

## From Geometry:

### Areas

Triangles / circles / sectors

### Similarity

## From Trigonometry:

Sine / cosine / tangent of special angles on unit circle

Inverse sine / cosine / tangent of special values

Pythagorean / reciprocal / quotient / negative angle / co-function identities

Sum & difference of angles identities

Trigonometric equations

## From Precalculus:

Graphs of basic functions (domain, range, intercepts, asymptotes, long run behavior)

Power  $y = x^n$  ( $n$  could be positive or negative, even or odd or reciprocal of integer)

Exponential  $y = b^x$  ( $b$  could be greater than or less than 1)

Logarithmic  $y = \log_b x$  ( $b$  could be greater than or less than 1)

Trigonometric  $y = \sin x$ ,  $y = \cos x$ ,  $y = \tan x$ ,  $y = \csc x$ ,  $y = \sec x$  or  $y = \cot x$

Inverse trigonometric  $y = \sin^{-1} x$ ,  $y = \cos^{-1} x$  or  $y = \tan^{-1} x$

### Piecewise functions

Graphing

Piecewise definition of absolute value

### Graphs of basic conics

Circles / ellipses / parabolas

Single step transformations of functions & graphs (relationship between algebraic & graphical transformations)

Horizontal / vertical

Shift / reflect / stretch & compress

Symmetry of functions & graphs (relationship between algebraic & graphical symmetry)

Even / odd

### Polynomial inequalities

**Unless stated otherwise, you must be able to solve these**  
**without your calculator**

- [1] Fill in the blanks. The answer is either a number, “undefined”, “cannot be determined without more information”:

$$\frac{1}{0} = \qquad \frac{0}{1} = \qquad \frac{0}{0} =$$

- [2] Let  $a, b$  be positive real numbers that are very close to 0. Let  $A, B$  be positive real numbers that are very large. Describe the size of the following expressions.

The answer is either “very close to 0”, “very close to 1”, “very large” or “cannot be determined without more information”.

Also, determine the sign of the expressions.

The answer is either “positive”, “negative” or “cannot be determined without more information”.

[i] $a + b$	[ii] $a - b$	[iii] $a \times b$	[iv] $\frac{a}{b}$	[v] $A + B$	[vi] $A - B$	[vii] $A \times B$
[viii] $\frac{A}{B}$	[ix] $a + A$	[x] $a - A$	[xi] $A - a$	[xii] $a \times A$	[xiii] $\frac{a}{A}$	[xiv] $\frac{A}{a}$
[xv] $\frac{1}{a}$	[xvi] $\frac{1}{A}$	[xvii] $A^2 - A^3$	[xviii] $\frac{5A^2 - 4A^3}{6 + 7A^2}$	[xix] $\frac{5A^2 - 4A^3}{6 + 7A^3}$	[xx] $\frac{5A^2 - 4A^3}{6 + 7A^4}$	

- [3] Find the slope-point form of the equation of the line through the points  $(-1, -3)$  and  $(-6, 4)$ .

- [4] Sketch  $f(x) = x^2 - 6x - 16$  by finding the  $x$ - and  $y$ -intercepts and the vertex (without any additional points).

- [5] Solve  $3x^2 - 2x = 9$ .

- [6] Complete the square for  $-2x^2 + 24x - 3$ . **NOTE: This does NOT involve solving an equation.**

- [7] Fill in the blanks. Write your answer without using exponents and without using radicals.

$$16^{\frac{1}{2}} = \qquad 8^{-3} = \qquad \left(\frac{27}{8}\right)^{\frac{1}{3}} = \qquad \left(\frac{4}{9}\right)^{-2} = \qquad 64^{-\frac{2}{3}} =$$

- [8] Simplify  $\frac{x^3 \sqrt{12x}}{3x^{-2}}$  by writing it in the form  $ax^n$ .

- [9] Simplify  $\frac{8}{\sqrt{3} + \sqrt{5}}$  by rationalizing the denominator.

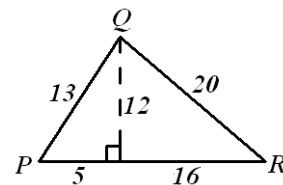
- [10] Add and simplify  $\frac{x-7}{x^2-4x+3} + \frac{x+7}{x^2-x-6}$ .

- [11] Rewrite  $(2x^3 - 6x^2 - 3x + 7) \div (x^2 - 2x + 3)$  using polynomial long division.

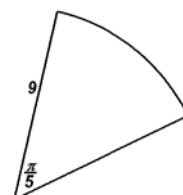
- [12] If  $f(x) = \frac{1}{1-2x}$ , simplify  $\frac{f(x+h) - f(x)}{h}$ .

- [13] Find all vertical asymptotes for the function  $f(x) = \frac{x^2 - 4}{x^2 - x - 12}$ .

- [14] Find the area of the triangle  $PQR$  on the right.



- [15] Find the area of the sector on the right with the given radius and central angle (in radians).



[16] Fill in the blanks.

$$e^0 = \quad \ln 0 = \quad e^1 = \quad \ln 1 = \quad \ln \sqrt{e} = \quad \ln \frac{1}{e^3} =$$

[17] Fill in the following table with all entries (in radians) that have exact values. Also, identify the entries which do not exist.

$x =$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{3}$	$-\frac{\sqrt{2}}{2}$	$-\sqrt{3}$	$-\frac{1}{2}$	$-1$	$0$	$1$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{3}$	$\frac{\sqrt{3}}{2}$
$\tan^{-1} x =$													
$\cos^{-1} x =$													
$\sin^{-1} x =$													

[18] State the following trigonometric identities.

[a] the 3 Pythagorean identities that involve the 6 trigonometric functions

[b] the co-function identities for each of the 6 trigonometric functions

[c] the double angle identities for  $\cos 2x$  (3 versions) and  $\sin 2x$

[19] Simplify  $\sin(x - \pi)$ .

[20] Simplify  $\cos(2\pi - x)$ .

[21] Find all solutions of  $1 + 3\sin x = 0$ , where  $0 \leq x \leq 2\pi$ . **[You will need to use your calculator.]**

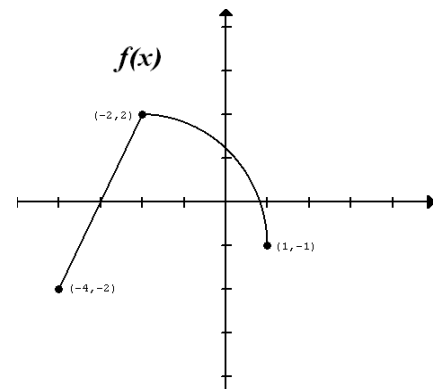
[22] Find all solutions of  $\cos 2x = -\frac{\sqrt{3}}{2}$ .

[23] Sketch the general shape and position of the following graphs. Do not worry about specific  $x$ - and  $y$ -coordinates.

$$\begin{array}{lll}
 y = x^5 & y = x^{-4} & y = x^{\frac{1}{3}} \\
 y = e^x & y = 0.5^x & \\
 y = \ln x & y = \log_{0.4} x & \\
 y = \cos x & y = \tan x & y = \csc x \\
 y = \sin^{-1} x & y = \cos^{-1} x & y = \tan^{-1} x \\
 x^2 + y^2 = 9 & 4x^2 + 9y^2 = 144 & 
 \end{array}$$

[24] The graph of  $f(x)$  is shown on the right. Sketch the following graphs.

$$\begin{array}{l}
 y = f(x) - 2 \\
 y = f(x + 2) \\
 y = f(2x) \\
 y = 2f(x) \\
 y = f(-x) \\
 y = -f(x)
 \end{array}$$



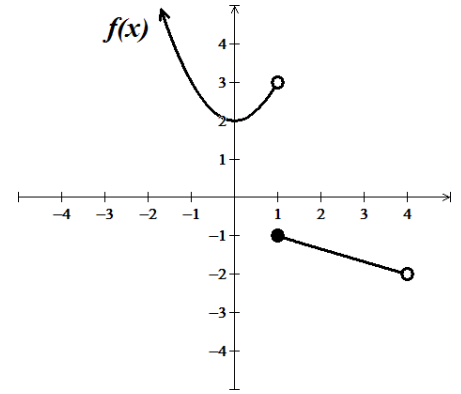
[25] Sketch the function  $f(x) = \begin{cases} 2x-3, & x < -1 \\ 1-x^2, & x \geq -1 \end{cases}$ .

[26] Determine algebraically if  $f(x) = x\sqrt{1+x^2}$  is symmetric about the  $y$ -axis, about the origin or neither.

[27] Determine algebraically if  $f(x) = \sin x - \cos x$  is even, odd or neither.

[28] Solve the inequality  $x^3 + 2x < 3x^2$ .

[29] The graph of  $f(x)$  is shown on the right. Write the domain and range of  $f$  using interval notation.



**HINT:**

The questions above involve material from the following classes.

Arithmetic:		[1], [2]
Geometry:		[14], [15]
Algebra:	Math 114	[3]-[10], [16]
Precalculus I:	Math 41	[11]-[13], [23]-[29]
Trigonometry:	Math 42	[17]-[23], [27]

**NOTE:**

There is no solution key for this prerequisite package since it only involves material that you have learned before. You are encouraged to work together with your classmates, and to consult your old textbooks and notes. Feel free to ask me to look over your solutions, or to direct you to relevant sections in your old textbooks. However, I will not give solutions to any questions.