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

From Algebra:

Quadratic functions
- Graphing
- Factoring
- Quadratic formula
- Discriminant & its uses (roots, intercepts, factoring into reals, factoring into rationals)
- Completing the square

Negative and fractional exponents
Graphs of systems of inequalities
Rational expressions
- Add / subtract
- Polynomial long division

From Geometry:

Areas
- Triangles / parallelograms / trapezoids / 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
Double angle / sum & difference of angles identities

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 $y = \tan^{-1} x$

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

Sigma notation for series

From Calculus:

Limits (especially involving infinity)
Continuity
Derivatives
Linear approximations
L'Hopital's rule
Anti-derivatives

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

All answers must be completely simplified

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

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

[3] Find the discriminant of $122x^2 - 111x + 25$. (Use your calculator.)
What does it tell you about the graph of $f(x) = 122x^2 - 111x + 25$?
What does it tell you about the roots of the equation $122x^2 - 111x + 25 = 0$?
What does it tell you about how $122x^2 - 111x + 25$ can be factored ?

[4] Complete the square for $-x^2 + 26x - 2$.

[5] Find $81^{-\frac{3}{4}}$.

[6] Simplify $\dfrac{x^{-\frac{2}{3}}x^{\frac{3}{4}}}{x^{-\frac{1}{2}}}$.

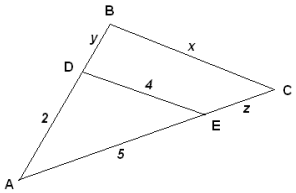
[7] Graph the solution set of $\begin{cases} 2x - y < 4 \\ x > y^2 - 1 \\ x < 0 \end{cases}$.

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

[9] Perform the long division $\dfrac{x^4 - x^3 - x^2}{x^2 + 2x + 5}$.

[10] Find the area of a sector of a circle of radius 8 with a central angle of 2 radians.

[11] Suppose $DE \parallel BC$ in the diagram on the right. Find a formula for y in terms of x.



[12] Find the area of the quadrilateral with vertices $(-6, -3)$, $(8, -3)$, $(-2, -9)$ and $(-8, -9)$.

[13] State the 3 Pythagorean identities that involve the 6 trigonometric functions.

[14] State the co-function identities for each of the 6 trigonometric functions.

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

[16] If $\csc x = 4$ and $\cot x < 0$, find $\sec x$ using identities, **NOT TRIANGLES**.

[17] If $\sin x = \dfrac{1}{3}$ and $\cos y = \dfrac{2}{3}$, find $\sin(y - x)$ and $\cos(x + y)$.

[18] Determine algebraically if $f(x) = \tan x - \csc x$ is symmetric about the $y-$ axis, about the origin or neither.

[19] Determine algebraically if $f(x) = \sec x - \cot x$ is even, odd or neither.

[20] Fill in the following table with all entries 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	$\frac{1}{2}$	$\sqrt{3}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{3}$	$\frac{\sqrt{3}}{2}$
$\tan^{-1} x =$													
$\cos^{-1} x =$													
$\sin^{-1} x =$													

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

$y = x^5$ $\quad$ $y = x^{-4}$ $\quad$ $y = x^{\frac{1}{3}}$

$y = e^x$ $\quad$ $y = 0.5^x$

$y = \ln x$ $\quad$ $y = \log_{0.4} x$

$y = \cos x$ $\quad$ $y = \tan x$ $\quad$ $y = \csc x$

$y = \sin^{-1} x$ $\quad$ $y = \cos^{-1} x$ $\quad$ $y = \tan^{-1} x$

$4x^2 + 9y^2 = 36$ $\quad$ $x^2 + y^2 - 6x + 8y = 0$

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

$y = f(x) - 2$

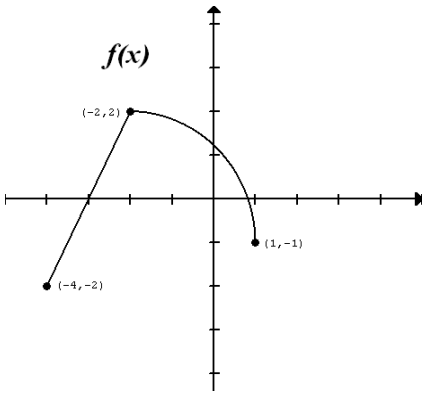
$y = f(x + 2)$

$y = f(2x)$

$y = 2f(x)$

$y = f(-x)$

$y = -f(x)$



[23] Write the series $\frac{3}{2^2 \cdot 4^0} + \frac{4}{3^2 \cdot 4^1} + \frac{5}{4^2 \cdot 4^2} + \frac{6}{5^2 \cdot 4^3} + \frac{7}{6^2 \cdot 4^4} + \frac{8}{7^2 \cdot 4^5}$ in sigma notation.

[24] Find the following limits. Each answer should either be a specific number, ∞, $-\infty$, or DNE (does not exist) only if the other three types of answers do not apply.

[a] $\lim_{x \to -\infty} x^6$ $\quad$ [b] $\lim_{x \to \infty} x^{-2}$ $\quad$ [c] $\lim_{x \to -\infty} x^{-5}$ $\quad$ [d] $\lim_{x \to 0^-} x^{-4}$

[e] $\lim_{x \to -\infty} e^x$ $\quad$ [f] $\lim_{x \to \infty} e^x$ $\quad$ [g] $\lim_{x \to 0} \csc x$ $\quad$ [h] $\lim_{x \to \frac{\pi}{2}^-} \tan x$

[i] $\lim_{x \to -1^-} \frac{x+2}{1-x^2}$ $\quad$ [j] $\lim_{x \to 1} \frac{x-2}{(1-x)^2}$ $\quad$ [k] $\lim_{x \to 0^+} \frac{1}{\ln x}$ $\quad$ [l] $\lim_{x \to 1} \frac{1}{\ln x}$

[m] $\lim_{x \to \infty} x^{-2} e^x$ $\quad$ [n] $\lim_{x \to \infty} x e^{-x}$ $\quad$ [o] $\lim_{x \to \infty} \frac{x}{\sqrt{3+2x^2}}$ $\quad$ [p] $\lim_{x \to \infty} \tan^{-1} x$

[25] Over what interval(s) are the following functions continuous ?

[a] $f(x) = x^3$ [b] $f(x) = x^{-2}$ [c] $f(x) = x^{\frac{3}{2}}$ [d] $f(x) = e^{3x}$

[e] $f(x) = \ln x$ [f] $f(x) = \sin x$ [g] $f(x) = \tan x$ [h] $f(x) = \csc x$

[i] $f(x) = \dfrac{x+2}{x^2 - 5x - 6}$ [j] $f(x) = \dfrac{1}{\ln x}$

[26] Find the derivatives of the following functions.

[a] $f(x) = e^{\cos^2 x}$ [b] $f(x) = \sqrt[3]{x}\,(\ln x)^2$ [c] $f(x) = \dfrac{\arctan x^2}{\sec 2x}$

[27] Find the general antiderivatives of the following functions.

[a] $f(x) = (2 - 5x^3)^2$ [b] $f(x) = \sin x - \cos x$ [c] $f(x) = e^x + e^{-x}$ [d] $f(x) = \csc^2 x$

[e] $f(x) = \dfrac{4}{x^5} - \dfrac{4}{x} - \dfrac{4}{\sqrt[5]{x}}$ [f] $f(x) = \dfrac{1}{1+x^2} - \dfrac{1}{\sqrt{1-x^2}}$

[28] Use a linear approximation to $f(x) = \tan x$ at $x = \dfrac{\pi}{3}$ to approximate $\tan 1$.

[29] Suppose the following statement is a fact: "If today is Monday, the drugstore is having a sale on energy drinks today".
Based on that statement, what can you conclude in each of the following situations ?

[a] Today is Tuesday.
[b] The drugstore is not having a sale on energy drinks today.
[c] Today is Monday.
[d] The drugstore is having a sale on energy drinks today.

HINT:

The questions above involve material from the following classes.

Geometry:		[11]-[12]
Algebra:	Math 114	[1]-[6], [8]-[9], [11]
Precalculus I:	Math 41	[18]-[19], [21]-[22]
Trigonometry:	Math 42	[10], [13]-[21]
Precalculus III:	Math 43	[7], [19], [21], [23]
Calculus I:	Math 1A	[24]-[28]

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.