

Are You Ready For AP Calculus AB?

Show all work on a separate sheet of paper.

1.) Simplify: (a) $\frac{x^3-9x}{x^2-7x+12}$ (b) $\frac{x^2-2x-8}{x^3+x^2-2x}$ (c) $\frac{\frac{1}{x}-\frac{1}{5}}{\frac{1}{x^2}-\frac{1}{25}}$ (d) $\frac{9-x^{-2}}{3+x^{-1}}$

2.) Rationalize the denominator: (a) $\frac{2}{\sqrt{3}+\sqrt{2}}$ (b) $\frac{4}{1-\sqrt{5}}$ (c) $\frac{1}{1+\sqrt{3}-\sqrt{5}}$

3.) Write each of the following expression in the form ca^pb^q where c , p , and q are numbers:

(a) $\frac{(2a^2)^3}{b}$ (b) $\sqrt{9ab^3}$ (c) $\frac{a(\frac{2}{b})}{\frac{3}{a}}$ (d) $\frac{ab-a}{b^2-b}$ (e) $\frac{a^{-1}}{(b^{-1})\sqrt{a}}$ (f) $\left(\frac{2}{a^3}\right)^2 \left(\frac{3}{b^2}\right)^{\frac{1}{a^2}}$

4.) Solve for x (do not use a calculator):

(a) $5^{x+1} = 25$ (b) $\frac{1}{3} = 3^{2x+2}$ (c) $\log_2 x = 3$ (d) $\log_3 x^2 = 2 \log_3 4 - 4 \log_3 5$

5.) Simplify: (a) $\log_2 5 + \log_2(x^2 - 1) - \log_2(x - 1)$ (b) $2 \log_4 9 - \log_2 3$ (c) $3^{2 \log_5 5}$

6.) Simplify: (a) $\log\left(10^{\frac{1}{2}}\right)$ (b) $\log\left(\frac{1}{10^x}\right)$ (c) $2 \log \sqrt{x} + 3 \log x^{\frac{1}{3}}$

7.) Solve the following equations for the indicated variables:

(a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$, for a (b) $V = 2(ab + bc + ca)$, for a
 (c) $A = 2\pi r^2 + 2\pi rh$, for positive r (d) $A = P + nrP$, for P
 (e) $2x - 2yd = y + xd$, for d (f) $\frac{2x}{4\pi} + \frac{1-x}{2} = 0$, for x

8.) For the equations (a) $y = x^2 + 4x + 3$ (b) $3x^2 + 3x + 2y = 0$ (c) $9y^2 - 6y - 9 - x = 0$
 complete the square and reduce to one of the standard forms $y = a(x - h)^2 + k$ or $x = a(y - k)^2 + h$

9.) Factor completely: (a) $x^6 - 16x^4$ (b) $4x^3 - 8x^2 - 25x + 50$ (c) $8x^3 + 27$ (d) $x^4 - 1$

10.) Find all real solutions to: (a) $x^6 - 16x^4 = 0$ (b) $4x^3 - 8x^2 - 25x + 50 = 0$ (c) $8x^3 + 27 = 0$

11.) Solve for x : (a) $3 \sin^2 x = \cos^2 x$; $0 \leq x < 2\pi$ (b) $\cos^2 x - \sin^2 x = \sin x$, $-\pi < x \leq \pi$
 (c) $\tan x + \sec x = 2 \cos x$; $-\infty < x < \infty$

12.) Without using a calculator, evaluate the following:

(a) $\cos 210^\circ$ (b) $\sin \frac{5\pi}{4}$ (c) $\tan^{-1}(-1)$ (d) $\sin^{-1}(-1)$
 (e) $\cos \frac{9\pi}{4}$ (f) $\sin^{-1} \frac{\sqrt{3}}{2}$ (g) $\tan \frac{7\pi}{6}$ (h) $\cos^{-1}(-1)$

13.) Solve the equations: (a) $4x^2 + 12x + 3 = 0$ (b) $2x + 1 = \frac{5}{x+2}$ (c) $\frac{x+1}{x} - \frac{x}{x+1} = 0$

14.) Solve the inequalities: (a) $x^2 + 2x - 3 \leq 0$ (b) $\frac{2x-1}{3x-2} \leq 1$ (c) $x^2 + x + 1 > 0$

15.) Solve for x : (a) $|-x + 4| \leq 1$ (b) $|5x - 2| = 8$ (c) $|2x + 1| = x + 3$

16.) Determine the equations of the following lines: (a) the line through $(-1, 3)$ and $(2, -4)$;
(b) the line through $(-1, 2)$ and perpendicular to the line $2x - 3y + 5 = 0$;
(c) the line through $(2, 3)$ and the midpoint of the line segment from $(-1, 4)$ to $(3, 2)$

17.) Find the point of intersection of the lines: $3x - y - 7 = 0$ and $x + 5y + 3 = 0$

18.) (a) Find the domain of the function $f(x) = \frac{3x+1}{\sqrt{x^2+x-2}}$.

(b) Find the domain and range of the functions: i) $f(x) = 7$ ii) $g(x) = \frac{5x-3}{2x+1}$
iii) $h(x) = e^{3x} - 4$ iv) $j(x) = \log_4(2x - 3) + 1$ v) $y = -2\sqrt{3-x} + 6$

19.) Simplify $\frac{f(x+h)-f(x)}{h}$, where (a) $f(x) = 2x + 3$ (b) $f(x) = \frac{1}{x+1}$ (c) $f(x) = x^2$

20.) Find the inverse of the functions: (a) $f(x) = 2x + 3$ (b) $f(x) = \frac{x+2}{5x-1}$
(c) $f(x) = x^2 + 2x - 1, x > 0$

21.) You should know the following trigonometric identities and the unit circle!!!

Odd/Even

$\sin(-x) = -\sin x$ $\cos(-x) = \cos x$ $\tan(-x) = -\tan x$
 $\csc(-x) = -\csc x$ $\sec(-x) = \sec x$ $\cot(-x) = -\cot x$

Reciprocal

$\sin x = \frac{1}{\csc x}$ $\cos x = \frac{1}{\sec x}$ $\tan x = \frac{1}{\cot x}$
 $\csc x = \frac{1}{\sin x}$ $\sec x = \frac{1}{\cos x}$ $\cot x = \frac{1}{\tan x}$

Quotient

$\tan x = \frac{\sin x}{\cos x}$ $\cot x = \frac{\cos x}{\sin x}$

Pythagorean

$\sin^2 x + \cos^2 x = 1$ $1 + \tan^2 x = \sec^2 x$ $1 + \cot^2 x = \csc^2 x$

Sum and Difference

$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$ $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$

Double Angle

$\sin 2x = 2 \sin x \cos x$ $\cos 2x = \cos^2 x - \sin^2 x$ $\cos 2x = 2\cos^2 x - 1$ $\cos 2x = 1 - 2\sin^2 x$

Power-Reducing

$\cos^2 x = \frac{1+\cos 2x}{2}$ $\sin^2 x = \frac{1-\cos 2x}{2}$

22.) You should know the following logarithmic/exponential properties!!!

$\log_a x + \log_a y = \log_a xy$ $\log_a x - \log_a y = \log_a \frac{x}{y}$ $p \log_a x = \log_a x^p$ $\frac{1}{p} \log_a x = \log_a x^{\frac{1}{p}}$

$a^x \cdot a^y = a^{x+y}$ $\frac{a^x}{a^y} = a^{x-y}$ $(a^x)^y = a^{xy}$