AP Calculus AB Prerequisites

1. Equations of lines

   - Slope-intercept
   - Point-Slope form

   Write the equation of the line through the point (1, -2) with slope 3 in (a) slope-intercept form and (b) point-slope form.

   Write the equation of the line through the point (1, -2) that is perpendicular to the above line (in point-slope form).

2. Even/Odd

   Even: f(x) = f(-x) & symm. to origin
   Odd: f(-x) = -f(x) & symm. to origin

   - Show that $y = -3x^3 - x^2 + 1$ is neither even nor odd

3. Composition of Functions

   f(x) = x + 3 $g(x) = 4x^2$

   - Find f(g(x)), g(f(x)), & f(f(2))

4. Geometric Transformations

   -Shifts, reflections, stretches, shrinks (without a calculator)

   - Sketch: $y = -2(x-3)^2 + 1$

5. Piecewise Functions

   - Sketch: $f(x) = \begin{cases} x+1, x<1 \\ 4, x=1 \\ -2x+1, x>1 \end{cases}$

6. Formulas to know
   - Distance
   - Slope
   - mid-point
   - Circle

7. Know how to find Horizontal & Vertical Asymptotes (and "holes" in graph)

   - Find all HA's &VA's & sketch the graph of:

   $$y = \frac{x-3}{x^2 - 2x - 3}$$

8. Trig Values

   - **Know The Unit Circle!**
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9. Inverses

   - Find the inverse of: f(x) = 2x – 6

10. Properties of Logs & Natural Logs

    (a) $y = \log_a x \rightarrow x = a^y$

    (b) $\log_b x = \frac{\log x}{\log b} = \frac{\ln x}{\ln b}$

    (c) $\log_b rs = \log_b r + \log_b s$

    (d) $\log_b x^n = n \log_b x$

    - Expand : $3\log_2\left(\frac{2x-1}{xy}\right)$
    - Simplify: $2e^{3\ln x}$
    - Show why: $\frac{\ln 9}{2} = \ln 3$
    - Condense: $2\ln x + 3\ln y - 4\ln z$
    - Simplify: $3\log_3 9$
    - Solve for x: $2\log_2(x+1) = 4$

Misc Trig….

Solve for x:

1. $\cos(2x) = \frac{\sqrt{3}}{2}$ on $0 \le x < 2\pi$
2. $2\sin\left(\frac{x}{3}\right) = \sqrt{3}$ on $0 \le x < 2\pi$

Know the Graphs of :

1. $y = x^2$
2. $y = x^3$
3. $y = x^4$
4. $y = \sqrt{x}$
5. $y = x^{1/3}$
6. $y = |x|$
7. $y = e^x$
8. $y = \ln x$
9. $y = \log x$
10. $y = \tan^{-1} x = \arctan x$
11. $y = \dfrac{1}{x}$
12. $y = \pm\sqrt{a^2 - x^2}$ (circle centered at (0,0), solved for y)
13. $r^2 = (x-h)^2 + (y-k)^2$ (circle, centered at (h,k))
14. 6 trig functions

Simplify:

$$\frac{\dfrac{1}{5-x} - \dfrac{1}{5}}{x}$$

Get a Common Denominator & Simplify:

$$\frac{3}{x+2} + \frac{2}{2x} + \frac{1}{4}$$

Simplify:

$$2\sqrt{5}\left(3\sqrt{2}\right) - 2\sqrt{10}$$

Simplify:

$$\frac{\dfrac{2x+8}{x^2-12} - \dfrac{1}{x}}{x+6}$$

Multiply and simplify:

$$\left(\frac{\sqrt{x+7}-2}{x+3}\right)\left(\frac{\sqrt{x+7}+2}{\sqrt{x+7}+2}\right)$$

Simplify:

1. $5e^{\ln x^2} + 2x^2 - \ln 1 + 4e^0 + 3\log_2 8 - \sin 2\pi - \cos\dfrac{\pi}{3} + \ln(e^{2x^2})$

2. $\dfrac{\ln 8}{\ln 2}$ 3. $3e^{4\ln x}$ 4. $3e^{(4+\ln 5)}$ 5. $\dfrac{4x^3 - 3x^2}{x^2}$ 6. $f(x) = -x^2 - 4x^3 - 2x^{-1}$, $f(-2) =$

Divide using either long or synthetic division:

a. $\dfrac{x^3 - 4x^2 - 5}{x-3}$ b. $\dfrac{3x^3 + 2}{x^2 - x - 7}$

True or False:

1. $\ln(x+y) = \ln x + \ln y$ 2. $\dfrac{x^2 + 3x(x+2)}{(x+2)} = x^2 + 3x$

Without using a calculator, which of these functions has a vertical asymptote at x=1? How do you know?

a. $y = \dfrac{x^2 - 3x + 2}{x-1}$ b. $y = \dfrac{x^2 - 5x + 6}{x-1}$ c. $y = \dfrac{x^2 - x - 2}{x-1}$

Find the horizontal asymptote for each function.

a. $y = \dfrac{x^2 - 3x + 2}{3x^2 - 1}$ b. $y = \dfrac{(2x-1)^3}{3x^3 - 1}$ c. $y = \dfrac{5x^2 - 3x + 2}{1 - x^3}$ d. $y = \dfrac{x - 4x^3}{x(5x^2 - 1)}$