AP Calculus AB
Summer Assignment

This summer assignment set is due the first day of school.

It will be turned in the first day of Calculus class.

You will take a test on the material within the first 2 weeks of school.

Work these problems on notebook paper. All work must be shown.

Find the x and y intercepts, domain and range, and sketch the graph.
You must be able to answer these without a calculator.

1. $y = 2 - x^2$

2. $y = -e^x$

3. $y = \ln(x + 3)$

4. $y = \sqrt{x - 1}$

5. $y = x^3 + 2$

6. $y = \begin{cases} x^2 + 1 , & if\ x > 0 \\ -2x + 2 , & if\ x < 0 \end{cases}$

7. $y = \sin 3x \ , \ 0 \leq x \leq 2\pi$

8. $y = 2\cos x \ , \ 0 \leq x \leq 2\pi$

Find the asymptotes (horizontal and vertical), x and y intercepts, and sketch the graph.
You must be able to answer these without a calculator.

9. $y = \frac{2}{x-1}$

10. $y = \frac{1}{(x+2)^2}$

Solve for x. Give answers in π form. Do not use degrees. Answers should in the interval $0 \leq x \leq 2\pi$.

11. $2\cos x + \sqrt{3} = 0$

12. $2cos^2 x + 3\cos x + 1 = 0$

13. $\sin 2x = \cos x$

14. $2cos^2 x + \sin x - 1 = 0$

15. $tan^2 x - \sec x = 1$

Solve for all values of x without a calculator: Decimal answers from calculators are not acceptable. Express answers in any appropriate simplified format.

16. $4e^{x+1} = 12$

17. $4(2x-5)^2 = 36$

18. $\sqrt{(5-4x)^3} = 3\sqrt{3}$

19. $\ln\left(\frac{x}{2} - 3e\right) = 1$

Factor and Simplify:

20. $x^2 - 10x + 21$

21. $2x^2 + 5x - 3$

22. $\frac{8x^2 - 2x}{x-4}$

23. $\frac{6x^2 + 7x - 3}{3x - 1}$

24. $8x^3 - y^3$

Completely simplify the trig expressions using trig conversion formulas:

25. $\frac{1-\cos^2 x}{\sin x}$

26. $\frac{\sin 2x}{\cos x}$

27. $\frac{\tan x}{\sin x}$

28. $\frac{1-2\sin^2 x}{6\cos^2 x-3}$

29. $\frac{3+3\tan^2 x}{\sec x}$

Application problems:
In Calculus you are required to solve many stated problems. The following problems will "refresh" your ability to read, interpret, and solve such problems. Work needs to be organized and easy to follow.

30. The populations P (in thousands) of Reno, Nevada from 2000 through 2007 can be modeled by $P = 346.8e^{kt}$, where t represents the year, with $t = 0$ corresponding to the year 2000. In 2005, the population of Reno was about 395,000.
    a. Find the value of k. Based on your value of k, is the population increasing or decreasing? Explain your answer.
    b. Use the model (equation you found) to find the population of Reno in 2015. Are the results reasonable? Explain your answer.
    c. According to the model, during what year will the population reach 500,000?

31. The number of bacteria in a culture is increasing according to the law of exponential growth, $y = ce^{kt}$. After 3 hours, there are 100 bacteria, and after 5 hours, there are 400 bacteria.
    a. Determine the values of c and k for the growth equation.
    b. How many bacteria will be present after 6 hours?

32. In traveling across flat land, you notice a mountain directly in front of you. Its angle of elevation to the peak is 3.5^0. After you drive 13 miles closer to the mountain, the angle of elevation is now 9^0. Determine the approximate height of the mountain.

33. A radio tower that is 150 feet tall is placed on top of a mountain that is 1200 feet above sea level. A radio operator is standing on a platform that is 400 feet above sea level and 2 miles horizontally from the mountain. What is the angle of depression from the top of the tower to the man standing on the platform (disregard the man's height).