Grade 11/12 Name:
AP Calculus
Summer Work

Do the following problems on looseleaf lined paper. Staple all together and turn in on the first day of AP Calculus. Note the acquisition after problem 20, i.e. there are more than 20 problems here.

1. Factor the following expressions **completely**:

$$2r^2u + 10ru - 6r^2v - 30rv$$

$$6x^4 - 48xy^3$$

2. Sketch the graphs of the following parabolas on separate axes making sure to list all salient points (vertex, x- and y- intercepts, Domain, Range, axis of symmetry):

$$f(x) = -2(x+3)^2 - 5$$
$$g(x) = x^2 - 6x + 1$$

3. Find the composition $f \circ g$ and $g \circ f$:

a) $f(x) = 2x^3 - 1, \qquad g(x) = \sqrt[3]{\dfrac{x-1}{2}}$

b) $f(x) = 2^{x+3} \qquad g(x) = 5x - 2$

4. State the domain of the function:

$$f(x) = \sqrt[5]{\frac{\log_{10} x^2 + 1}{2}}$$

5. Sketch the graph of the function $f(x) = \frac{-1}{0.5}\sec(x - \frac{\pi}{2})$

6. Find all solutions in the interval $[0, 2\pi)$ for the following trigonometric equations:

a) $2\sin^2 x = 1$
b) $\cos^3 x = \cos x$

7. State and prove the quadratic formula.

8. Find all solutions for: $\sin 2x \cos 2x = 0$
9. Prove the following identity:

$$\sec x - \cos x = \sin x \cdot \tan x$$

10. Is the following formula an identity? Please give a brief reason for your reply. **A simple yes or no will not earn any points.**

$$\sin\theta = \sqrt{1-\cos^2\theta}$$

11. Sketch the graph of the following function:

$$f(x) = -2x^4 + 2x^3 + 1$$

12. Solve for x:

$$\log_2(x^2-9) - \log_2(x+3) = 2$$

13. Solve for y:

$$\log_5(y^2 - 4y) = 1$$

14. **Prove** that: $\log(x+\sqrt{x^2-1}) = -\log(x-\sqrt{x^2-1})$

15. Solve for x:

$$\log_2(x+5) - \log_2(x-2) = 3$$

16. Find the partial fraction decomposition of: $\dfrac{5}{5x-x^2}$

17. Solve for x:

$$\frac{e^x - e^{-x}}{e^x + e^{-x}} = \frac{1}{4}$$

18. Prove the following identity:

$$(\sec\theta - \tan\theta)^2 = \frac{1-\sin\theta}{1+\sin\theta}$$

19. Sketch the graph of :

$$f(\theta) = \sin(2\theta + \tfrac{\pi}{2})$$

20. Sketch the graph of:

$$f(x) = \frac{x^2 + 2x - 15}{x-2}$$

Lastly, acquire the Princeton Review AP Calculus Prep 12th Edition, ISBN 9780593518212 and Read/do the problem sets through p.140