Calculus Memorize This Quiz Name_____

Find the derivative of each quantity.
Note that u and v are functions of x (i.e. u(x) , v(x))

1) $\frac{d}{dx}(\sin u) =$ __cos u · du/dx___

2) $\frac{d}{dx}(\sec u) =$ ___ · du/dx _____

3) $\frac{d}{dx}(\ln|u|) =$ ____ · du/dx ____

4) $\frac{d}{dx}(\sin^{-1} u) =$ ____ · du/dx _____

5) $\frac{d}{dx}(\tan^{-1} u) =$ _____ · du/dx ____

6) $\frac{d}{dx}(a) =$ _____
where a = constant

7) $\frac{d}{dx}(\cos u) =$ ___ · du/dx ____

8) $\frac{d}{dx}(\log_a|u|) =$ _____ · du/dx _____

9) $\frac{d}{dx}(e^u) =$ _____ · du/dx ____

10) $\frac{d}{dx}(uv) =$ _____ · du/dx ___

11) $\frac{d}{dx}(\tan u) =$ _____ · du/dx ____

12) $\frac{d}{dx}(\csc u) =$ _____ · du/dx

13) $\frac{d}{dx}(\cos^{-1} u) =$ _____ · du/dx

14) $\frac{d}{dx}(\sec^{-1} u) =$ _____ · du/dx

15) $\frac{d}{dx}\left(\frac{u}{v}\right) =$ _____ · du/dx _

16) $\frac{d}{dx}(u+v) =$ _____ · du/dx

17) $\frac{d}{dx}(a^u) =$ _____ · du/dx

18) $\frac{d}{dx}(u^n) =$ _____ · du/dx _
where n is an integer

19) $\frac{d}{dx}(f(g(x))) =$ _____

20) $\frac{d}{dx}(\cot u) =$ _____

Integrate as indicated. Note that a is a positive real number.

21) $\int \cos(u)\,du =$ _____

22) $\int \sin(u)\,du =$ _____

23) $\int \sec(u)\,du =$ _____

24) $\int \frac{1}{u}\,du =$ _____

25) $\int \tan u\,du =$ _____

26) $\int \frac{1}{1+u^2}\,du =$ _____

27) $\int \csc^2 u\,du =$ _____

28) $\int a^u\,du =$ _____

29) $\int \sec u \tan u\,du =$ _____

30) $\int e^u\,du =$ _____

31) $\int \frac{1}{u\sqrt{u^2-1}}\,du =$ _____

32) $\int \frac{1}{\sqrt{1-u^2}}\,du =$ _____

33) $\int \sec^2 u\,du =$ _____

34) $\int \csc u \cot u\,du =$ _____

35) $\int \csc u\,du =$ _____

36) $\int \cot u\,du =$ _____

$f(x) = x + \cos x$ $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$

Name_____ Date _____ Per. ____

~~STUFF YOU MUST KNOW COLD: *PRACTICE* CALC~~

Objective: Demonstrate that you know cold important basic information for the ap exam

1. Write the definition of the derivative.

$f'(x) = \lim_{\Delta x\to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$

Take the derivative of the following

2. $y=\sin e^{3x}$ $\Rightarrow y' = 3e^{3x}\cos e^{3x}$
3. $f(x)=\cos 4^3$ $\Rightarrow f' = 0$
4. $y=\ln(\csc x)$
5. $y=\sec^{-1}(x/3)$ $= \frac{3}{|x|\sqrt{x^2-9}}$
6. $g(x)=\tan^{-1}(x-2)$ $\frac{1}{1+(x-2)^2}$
7. $f(x)=\cot -x^2$
8. $y=2.1^x$ $\Rightarrow y' = 2.1^x \ln 2.1$
9. $y=\log_{10} x$ $= \frac{\ln x}{\ln 10} \Rightarrow y' = \frac{1}{x\ln 10}$
10. $f(x)=\tan^{-1}(\tan x)$ $= x$ $\Rightarrow f'(x) = 1$ $\frac{\sec^2 x}{1+\tan^2 x}$
11. $y=\sin^{-1}(\cos x)$

Evaluate the following

12. $\sin^{-1}\frac{\sqrt{3}}{2}$
13. $\sin 0$
14. $\cos \pi/4$
15. $\tan \pi/6$
16. $\cos^{-1}(0.5)$

Find the antiderivative. Circle your answer.

17. $\int \frac{x-2}{x-1}dx$ $= x - \ln|x-1| + C$

$x-1 \overline{)\, x-2}$ $\quad 1 - \frac{1}{x-1}$

$-(x-1)$

-1

18. $\int_{\frac{\pi}{4}}^{0} -\sec^2 x\,dx = -\tan x\Big|_{\pi/4}^{0}$ $= -(-\tan \pi/4)$ $= 1$
19. $4\int \tan 2x\,dx$ $= 2\ln|\sec 2x| + C$

Let $u = 2x$

$\frac{1}{2}du = dx$

20. $\frac{d}{dx}(\sin^2 x^3) = 2\sin x^3 \cdot \cos x^3$
21. $\int_0^1 x^4 e^{2x^5}dx = \frac{1}{10}e^{2x^5}\Big|_0^1 = \frac{1}{10}(e^2-1)$

Let $u = 2x^5$

22. What is a normal line? How does its slope compare to the slope of the tangent at a particular point?

$-\frac{1}{m}$ neg reciprical

23. $\int \frac{x^2}{(5x^3+2)^2}dx$

$f(x) = 2\cos(3x)$

$\omega = B = \frac{2\pi}{T}$

Name_____ Date April 28, 2005 Per. _____

STUFF YOU MUST KNOW COLD #2 CALC

Objective: Demonstrate that you know cold important basic information for the ap exam

Take the derivative of the following

1. x^n
2. $\sin 3x \rightarrow y' = 3\cos 3x$
3. $\cos 2 \rightarrow y' = 0$
4. $\ln(\sec x) \rightarrow y' = \frac{1}{\sec x}\sec x\tan x = \tan x$
5. $\csc x \rightarrow y' = -\csc x \cot x$
6. $\csc^{-1}(x/3) \rightarrow y' = \frac{-1}{\left|\frac{x}{3}\right|\sqrt{\left(\frac{x}{3}\right)^2 - 1}} \cdot \frac{1}{3}$
7. $\cot^{-1}(x-2) \rightarrow y' = -1/(1+(x-2)^2)$
   $= -1/(x^2-4x+5)$
8. $\cot^{-1} x^2 \rightarrow y' = 2x\csc^2(-x^2)$
9. $3\sec x \rightarrow y' = 3\sec x \tan x$
10. $\sec^{-1} x \rightarrow y' = \frac{1}{|x|\sqrt{x^2-1}}$
11. $a^x \rightarrow y' = a^x \ln a$
12. $\log_a x = \ln x/\ln a \rightarrow y' = 1/(x \ln a)$
13. $\tan^{-1}(\tan x) = x \rightarrow y' = 1$
14. $\cos^{-1} x \rightarrow y' = -1/\sqrt{1-x^2}$
15. $e^{2x^5} \rightarrow y' = 10x^4 e^{2x^5}$
16. $\sin^{-1} x \rightarrow y' = 1/\sqrt{1-x^2}$

Evaluate the following

17. $\sin^{-1} 0 = 0$
18. $\sin 30° = 1/2$
19. $\tan \pi = 0$
20. What is 30 degrees in radians? $\pi/6$
21. $\cos^{-1}(-1) = \pi$

Find the antiderivative

22. $\int \frac{1}{x^2-4x+4}dx = \int \frac{1}{(x-2)^2}dx$

    Let $u = x-2$ $= \int \frac{1}{u^2}du = \int u^{-2}du$

    $= -1(x-2)^{-1} + C$

23. $\int_0^{\sqrt{2}} \frac{dx}{\sqrt{4-x^2}} = \int_0^{\sqrt{2}} \frac{\frac{1}{2}}{\frac{1}{2}\sqrt{4-x^2}}dx$

    $= \frac{1}{2}\int_0^{\sqrt{2}} \frac{1}{\sqrt{1-\left(\frac{x}{2}\right)^2}}dx$ Let $u = \frac{x}{2}$ $\Rightarrow 2du = dx$

    $= \int_{x=0}^{x=\sqrt{2}} \frac{1}{\sqrt{1-u^2}}du = \sin^{-1}\left(\frac{x}{2}\right)\Big|_0^{\sqrt{2}} = \frac{\pi}{4}$

24. $\int \sec x\,dx = \ln|\sec x + \tan x| + C$
25. $\int -\sec x \tan x\,dx = -\sec x + C$
26. $4\int \tan 2x\,dx = 2\ln|\sec 2x| + C$
27. $\int_1^e \frac{dx}{2x} = \frac{1}{2}\ln x\Big|_1^e = \frac{1}{2}(1-0) = 1/2$

    Let $u = 2x$, $\frac{1}{2}du = dx$ $\frac{1}{2}\ln|2x|\Big|_1^e$

28. $\int (x^3-1)^4 x^2\,dx = \frac{1}{3}\cdot\frac{1}{5}(x^3-1)^5 + C$

    Let $u = x^3 - 1$

29. $\int_0^1 \frac{1}{2} x e^{x^2}dx = e^1 - e^0 = e - 1$

    Let $u = x^2$

30. State the Fundamental Theorem of Calculus

31. State the Intermediate Value Theorem

32. State the Chain Rule for Differentiation

33. Symbolically write the Quotient Rule.

34. How do you find the critical points (get at least 2 of the 3 acceptable answers)?
$f'=0$ or is undefined

35. What does an inflection point signify?
Change in concavity

36. Does the second derivative need to exist for there to be an inflection point?
NO, it could be undefined

37. How do you find a local maximum?

38. What are the critical points of $f(x)=(2x-5)^3(x+4)^2$

$f'(x)=6(2x-5)^2(x+4)^2+2(2x-5)^3(x+4)$

$=(2x-5)^2(x+4)(6x+24+4x-10)$

$10x+14$

$x=\frac{5}{2}, -4, -1.4$

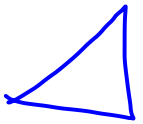
39. $\int \frac{-11}{(x+2)^2}dx = \frac{11}{x+2}+C$

$u=x+2$

$-11\int \frac{1}{u^2}du = -11\int u^{-2}du$

40. $\int \sqrt{t^2-1}\,dt$

By Trig Substitution - draw triangle
(bonus - not on AB exam)



41. Take the derivative of $\sqrt{t^2-1}$

$y'=\frac{1}{2}(t^2-1)^{-\frac{1}{2}}(2t)=\frac{t}{\sqrt{t^2-1}}$

42.

$\int_0^1 7^x dx = \frac{7^x}{\ln 7}\Big|_0^1 = \frac{7-1}{\ln 7}$

$=\frac{6}{\ln 7}$

43. State the MVT (Mean Value Theorem).

44. How do you find the average velocity?
$\frac{\text{final postion - initial position}}{\text{total time}}$ or

$=\frac{\int_{t_1}^{t_2} v(t)\,dt}{t_2-t_1}$