CALC 2 - REVIEW/PREVIEW UNIT 1

TEST YOURSELF ON THESE BASIC DERIVATIVES:

1. $\frac{d}{dx}(c) = 0$

2. $\frac{d}{dx}(x) = 1$

3. $\frac{d}{dx}(5x) = 5$

4. $\frac{d}{dx}(x^2) = 2x$

5. $\frac{d}{dx}(x^3) = 3x^2$

6. $\frac{d}{dx}\left(\frac{1}{x}\right) = -\frac{1}{x^2}$

7. $\frac{d}{dx}(\sqrt{x}) = \frac{1}{2\sqrt{x}}$

8. $\frac{d}{dx}\left(\frac{1}{\sqrt{x}}\right) = -\frac{1}{2}x^{-\frac{3}{2}}$

9. $\frac{d}{dx}[f(x)+g(x)] = \frac{d}{dx}[f(x)] + \frac{d}{dx}[g(x)]$

10. $\frac{d}{dx}[f(x)-g(x)] = \frac{d}{dx}[f(x)] - \frac{d}{dx}[g(x)]$

11. $\frac{d}{dx}(f(x)g(x)) = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$

12. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}[f(x)] - f(x)\frac{d}{dx}[g(x)]}{[g(x)]^2}$

13. $\frac{d}{dx}[cf(x)] = c\frac{d}{dx}[f(x)]$

14. $\frac{d}{dx}[f(g(x))] = f'(g(x))\cdot g'(x)$

15. $\frac{d}{dx}[x^n] = nx^{n-1}$

16. $\frac{d}{dx}(cx^n) = cnx^{n-1}$

17. $\frac{d}{dx}(e^x) = e^x$

18. $\frac{d}{dx}(a^x) = \ln a \cdot a^x$

19. $\frac{d}{dx}(\ln|x|) = \frac{1}{x}$

20. $\frac{d}{dx}(\log_a|x|) = \frac{1}{\ln a}\cdot\frac{1}{x}$

21. $\frac{d}{dx}(\sin x) = \cos x$

22. $\frac{d}{dx}(\cos x) = -\sin x$

23. $\frac{d}{dx}(\tan x) = \sec^2 x$

24. $\frac{d}{dx}(\sec x) = \sec x \tan x$

25. $\frac{d}{dx}(\cot x) = -\csc^2 x$

26. $\frac{d}{dx}(\csc x) = -\csc x \cot x$

27. $\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$

28. $\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$

29. NEW! $\frac{d}{dx}(\operatorname{arcsec} x) = \frac{1}{x\sqrt{x^2-1}}$

(provided arcsec x is defined to have the range $[0, \pi/2) \cup [\pi, \frac{3\pi}{2})$)

FIND THE DERIVATIVE OF EACH OF THE FOLLOWING FUNCTIONS. YOU SHOULD BE ABLE TO DO THESE QUICKLY AND COMPLETELY FREE OF ERRORS

1. $f(x) = e^{\sqrt{x}}$

$f'(x) = e^{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}}$

2. $f(x) = \frac{x^3}{\log_2(\cos x)}$

$f'(x) = \frac{\log_2(\cos x)\cdot 3x^2 - x^3 \cdot \frac{1}{\ln 2}\cdot\frac{-\sin x}{\cos x}}{[\log_2(\cos x)]^2}$

3. $f(x) = 2\pi^{\arctan\sqrt{x}}$

$f'(x) = 2\cdot\ln\pi\cdot\pi^{\arctan\sqrt{x}}\cdot\frac{1}{1+x}\cdot\frac{1}{2\sqrt{x}}$

4. $f(x) = \frac{\sin(x^2)}{x^2}$

$f'(x) = \frac{x^2\cdot\cos(x^2)\cdot 2x - \sin(x^2)\cdot 2x}{x^4}$

5. $f(x) = \frac{x^2+1}{\sqrt{x}} + \frac{\sqrt{x}+x+1}{3x}$

$= x^{3/2} + x^{-\frac{1}{2}} + \frac{1}{3}x^{-\frac{1}{2}} + \frac{1}{3} + \frac{1}{3}\cdot\frac{1}{x}$

$f'(x) = \frac{3}{2}x^{\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}} - \frac{1}{6}x^{-\frac{3}{2}} - \frac{1}{3x^2}$

6. $f(x) = \sin(xe^{3x})$

$f'(x) = \cos(xe^{3x})\cdot[x\cdot 3e^{3x} + e^{3x}]$

7. $f(x) = \sec(\ln x)$

$f'(x) = \frac{\sec(\ln x)\tan(\ln x)}{x}$

8. $f(x) = x\sqrt{x^2-1}$

$f'(x) = \frac{x^2}{\sqrt{x^2-1}} + \sqrt{x^2-1}$

9. $f(x) = \ln(\ln(\ln x))$

$f'(x) = \frac{1}{\ln(\ln x)}\cdot\frac{1}{\ln x}\cdot\frac{1}{x}$

10. $f(x) = \cot(\frac{1}{x})$

$f'(x) = \frac{\csc^2(\frac{1}{x})}{x^2}$

11. $f(x) = \log(\arcsin x^2)$

means $\log_{10}(\arcsin(x^2))$

$f'(x) = \frac{1}{\ln 10}\cdot\frac{1}{\arcsin(x^2)}\cdot\frac{2x}{\sqrt{1-x^4}}$

12. $f(x) = \sqrt{x+\sqrt{x+1}}$

$f'(x) = \frac{1}{2\sqrt{x+\sqrt{x+1}}}\cdot\left(1+\frac{1}{2\sqrt{x+1}}\right)$