First Name:____________________ Last Name: _________________ Student ID: ________

Derivatives (3)

1. Differentiate.

a. f(x) = $x^2 + 2^x + \log_2 x$	b. f(x) = $\sin(x^2) + sin^2$x
c. f(x) = x^x	d f(x) = $x^{x \ln x}$
e. f(x) = arctan(x) *(where arctan(x) = tan^{-1}(x))*	f. f(x) = arcsin(x) *(where arcsin(x) = sin^{-1}(x))*
g. f(x) = $\sin^3$x + sin3x	h. f(x) = $e^x + x^e$
i. f(x) = ln(x + $\sqrt{x^2+1}$)	j. f(x) = $\left(\frac{x}{x+1}\right)^{2016}$
k. f(x) = $x^{\sin x}$	l. f(x) = xlnx

2. Evaluate h'(e) for h(x) = $\sqrt{\ln x}$.	**3.** If g(x) = $e^{2x-1}\ln(2x-1)$, evaluate g'(1).
4. Evaluate f'(2) for f(x) = $\cos\frac{\pi}{x}$.	**5.** Determine f'(0) for f(t) = $2e^{3t}$-5t.
6. Find $\frac{dy}{dx}$ at x = 0 for y = $\frac{x\cos x}{1+e^x}$.	**7.** Find y'($\frac{\pi}{2}$) for y = $x^{\sin x}$

8. To determine retention, a group of calculus students was given an exam and then equivalent forms of the exam at one month intervals thereafter. Students were told not to study between exams. The average on these exams after t months was found to be S(t) = 72 - 15ln$(t+1)$.

a. Determine the average score after 12 months.

b. At what rate was the average score changing after 4 months?

9. The voltage supplied to an electrical circuit is given by v(t) = $2\cos(t)+\cos(2t)$, as a function of time, in seconds. Find the times in the interval $0 \leq t \leq 2\pi$ at which the rate of change of the voltage is 0.

10. An object is suspended from the end of a string. Its displacement from the equilibrium position is s(t) = $8\sin(10\pi t)$. Calculate the velocity and acceleration of the object at any time t.

11. Use implicit differentiation to find $y'(1)$ if $y(x)$ is defined by the equation $x^3+\tan(y)=2x$ for $-\frac{\pi}{2} < y < \frac{\pi}{2}$.

12. Find all x such that f'(x) = 0 where f(x) = $\cos(x + \frac{1}{x})$.