SI Final Exam Review
Saturday May 9th
12:00 PM – 2:00 PM
Room 1245

Prof. Stockton : Calculus I
Spring 2009
SI Leader : Neil Jody

[1] Evaluate each limit, if it exists. Your answer should be a number, ∞, $-\infty$, or DNE.

(a) $\lim_{x\to 0} \frac{\sin 4x}{\sin 3x}$

(b) $\lim_{x\to 1^-} \frac{3x-3}{|x-1|}$

(c) $\lim_{x\to 1^-} g(x)$ where $g(x) = \begin{cases} \frac{x}{x+2} & \text{if } x \le 1 \\ \frac{-2}{x-1} & \text{if } x > 1 \end{cases}$

(d) $\lim_{x\to 1} \frac{\sqrt{x^2+3x}-2}{x-1}$

(e) $\lim_{x\to 3} \frac{\sin(x-3)}{x^2-9}$

(f) $\lim_{x\to 0} \frac{\frac{1}{x+2}-\frac{1}{2}}{x}$

(g) $\lim_{x\to \infty} \frac{\sin\sqrt{x}}{\sqrt{x}}$

(h) $\lim_{x\to \infty} \frac{3x^2-5x}{4-2x^3}$

(i) $\lim_{x\to -\infty} \frac{2x-3}{\sqrt{3+2x^2}}$

[2] Find the vertical and horizontal asymptotes of the function $f(x)=\dfrac{x^2+2x+1}{x^2+6x+5}$.

[3] A bionic man is programmed to run the 80-meter dash in such a way that the distance, s, run after t seconds is given by $s=\frac{1}{4}t^2+6t$ (meters). Find the runner's velocity when he crosses the finish line.

[4] Let $f(x)=\sqrt{x}$ .Find the largest real number $\delta>0$ such that if $0<|x-4|<\delta$, then $|f(x)-2|<0.05$.

[5] Use the definition of derivative to find the derivative of $k(x)=\cos x$.

[6] Find the derivatives of each of the following functions. Do not simplify the result.

(a) $h(x)=\dfrac{\sqrt{2x+3}}{x^3+2x-1}$

(b) $w(x)=\sin(\sec(\tan x))$

[7] Find $\dfrac{dy}{dx}$ in each case.

(a) $y=\log_x 5$

(b) $y=(\cos x)^x$

(c) $y=x^2e^{3x}$

[8] Evaluate each integral.

(a) $\int \cos x e^{\sin x}dx$

(b) $\int_0^{\ln 3}\dfrac{e^{3x}-e^x}{e^{2x}}dx$

(c) $\int \dfrac{e^{-x}}{1+e^{-x}}dx$

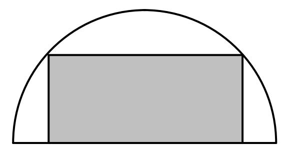
(d) $\int_1^e \frac{(\ln x)^4}{x} dx$

(e) $\int \frac{\sin(\ln x)}{x} dx$

(f) $\int_0^{\pi/6} \frac{\cos x}{2\sin x + 1} dx$

[8] For the curve given by $y^2 + x^2 y^3 + 11 = 4x$, find an equation of the tangent line at the point $(2,-1)$. Write the equation in the form $y = mx + b$.

[9] Find the dimensions of the rectangle of maximum area that can be inscribed in a semicircle of radius 4.



[10] A snowball is melting in the hot Pasadena sun. At the moment when the radius of the snowball is 3 inches, the volume of the snowball is decreasing at $4\pi\ \text{in}^3/\text{sec}$. How fast is the radius changing at that time?

[11] Let $f(x) = \sqrt[3]{x}(x-8)$. Find each of the following:

(a) open interval(s) on which f is increasing ________________________

(b) open interval(s) on which f is decreasing ________________________

(c) relative minima ________________________

(d) relative maxima ________________________

[12] Let $f(x) = x^4 - 6x^3$. Find each of the following:

(a) open interval(s) on which f is concave up ________________________

(b) open interval(s) on which f is concave down ________________________

(c) inflection points of f ________________________

[13] Find the absolute extrema of the function $f(x) = \frac{2x}{x^2+1}$ on the interval $[0,2]$.