SI Session: Review Exam I
Tuesdays: 3:30 PM – 5:00 PM
Thursdays: 1:30 PM – 3:00 PM
& 3:30 PM – 5:00 PM
Room 1245 SNAD

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

Part One: To be done without the use of a calculator.

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

(a) $\lim_{x\to -3} \dfrac{x^2+2x}{|3x-1|}$

(b) $\lim_{x\to -\infty} \dfrac{\sqrt{5x^2+1}}{2x-3}$

(c) $\lim_{x\to 2^-} \dfrac{|x-2|}{2x-4}$

(d) $\lim_{x\to 5} \dfrac{x^2-4x-5}{x^2-8x+15}$

[1] (continued)

(e) $\lim_{x\to-\infty}\dfrac{|x+1|}{3x-1}$

(f) $\lim_{x\to 2^+} f(x)$ where, $f(x)=\begin{cases} x+3 & \text{if } x\le 2 \\ 2x-1 & \text{if } x>2 \end{cases}$

(g) $\lim_{x\to 0}\dfrac{\sin 3x}{2x}$

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

(i) $\lim_{x\to 4^-}\dfrac{3-2x}{x-4}$

(j) $\lim_{x\to 2}\dfrac{1-\sqrt{2x-3}}{x-2}$

[1] (continued)

(k) $\lim_{x\to 0}\dfrac{\sin x}{1+\cos x}$

(l) $\lim_{h\to 0}\dfrac{\dfrac{1}{x+h-3}-\dfrac{1}{x-3}}{h}$

[2] Let $f(x)=\dfrac{\sin x}{x^2+2x}$. Find the discontinuities of f and determine if each is removable or nonremovable.

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

Part Two: Calculators permitted.

[4] Use the *definition of the derivative* to find the derivative of $f(x)=\sqrt{3-x}$.

[5] Let $f(x)=\begin{cases} x^4-2x & \text{if } x<1 \\ 2x-3 & \text{if } x\geq 1 \end{cases}$

(a) Determine if f is continuous at $x=1$.

(b) Determine if f is differentiable at $x=1$.

[6] Let $f(x) = 4x - 1$. Find the Largest real number $\delta > 0$ such that if $0 < |x - 1| < \delta$, then $|f(x) - 3| < 0.02$.

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

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

(b) $f(x) = -3\sin x + \frac{4}{5}\cos x$

[8] A ball is propelled upward from a platform 144 feet high. Neglecting air resistance, its height s above the ground at time t is given by the position function $s(t) = -16t^2 + 48t + 144$, where t is seconds and s is in feet.

(a) Find the average velocity of the ball during the time interval $[0,4]$.

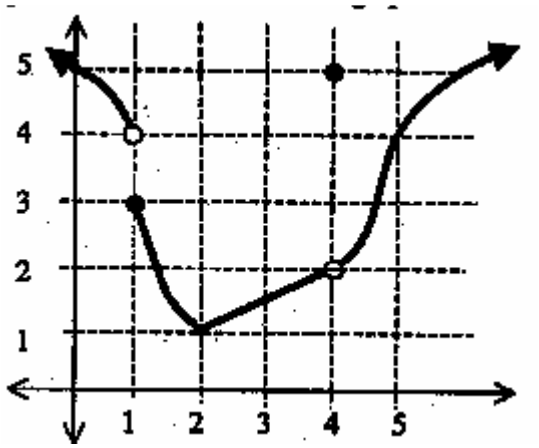
(b) Find the instantaneous velocity when $t = 3$.

(c) Find the maximum height of the ball above the ground.

[9] Find an equation of the tangent line to the graph of $f(x) = x^4 - 3x^3 + 5x^2 - 3x + 1$ at the point $(2,7)$.

[10] Let f be the function whose graph is shown below. Use the graph to answer each of the following questions:

(a) Find $\lim_{x \to 1^-} f(x)$



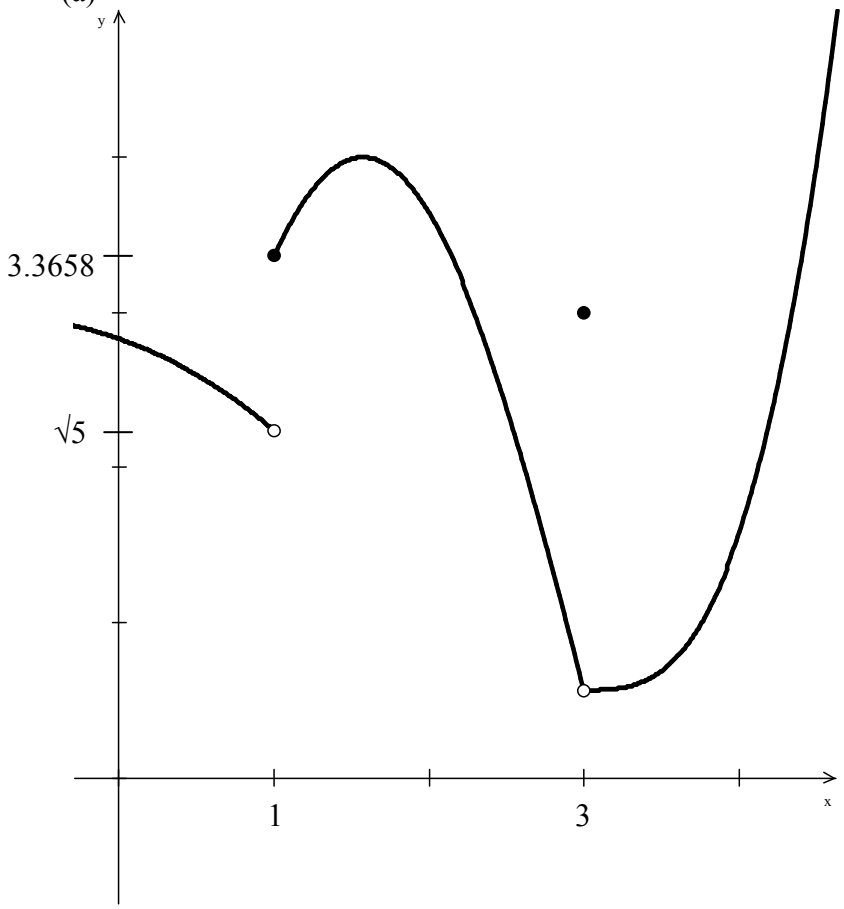
(b) Find $\lim_{x \to 2} f(x)$

(c) Is f differentiable at $x = 2$? Explain.

(d) Is f differentiable at $x = 4$? Explain.

[11] For each of the following functions, find the discontinuities and classify as removable or nonremovable. In order to receive full credit you must justify your answer analytically.

(a)



(b) $f(x)=\dfrac{6x^2-11x+3}{2x^2-x-3}$

(c) $f(x)=\dfrac{|x-1|}{x-1}$

[12] Find the value of k that will make the function $f(x)=\begin{cases} x^2+4 & \text{if } x\le 0 \\ k\cos x & \text{if } x>0 \end{cases}$ continuous at 0.

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

(a) $f(x) = 2x^3 - x^2 + 3x$

(b) $y = \dfrac{5}{(2x)^3} + 2\cos x$

(c) $f(x) = x^2 - 3x - 3x^{-2}$

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

(e) $f(x) = \dfrac{2}{\sqrt[3]{x}} + 3\cos x$