MATH 1500 A01 Assignment 2 Winter 2010 (Due date is February 12)

[36] 1. Evaluate each of the following limits. In case the limit does not exist, determine whether the limit is ∞, $-\infty$ or neither.

(1) $\lim_{x\to-\infty} \dfrac{\sqrt{x^4+x}}{(x+1)(2x-1)}$

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

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

(4) $\lim_{x\to1} \dfrac{x^2-x-3}{(x-1)^2}$

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

(6) $\lim_{x\to0} \left(\sqrt{\dfrac{1}{x^2}+1}-\sqrt{\dfrac{1}{x^2}}\right)$

(7) $\lim_{x\to\infty} (\sqrt{4x+x^2}-x)$

(8) $\lim_{x\to0} \dfrac{3x}{\sin 2x}$

(9) $\lim_{t\to0} \dfrac{\sin t}{\sin 4t}$

[15] 2. Use **only** definition of derivative to find the derivative of each function. (DO NOT USE DIFFERENTIATION RULES)

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

[40] 3. Find the derivative of each of the following functions.

(1) $y=\sqrt[4]{x^9}+(\dfrac{3}{2})^2-e^{\pi^2}x$

(2) $y=4\sqrt[3]{x}+\sec x+\dfrac{1}{x^2}+\sin 2$

(3) $y=\dfrac{\cos x}{1+\sqrt{x}}$

(4) $f(x)=(\tan x)(\dfrac{x^4+5}{e^x})$

(5) $g(x)=(x-x^2)^2+\pi^{-7}(2.4)^\pi$

(6) $h(x)=(\sin^2 x)\sqrt{x^2+e^x}$

(7) $k(x)=\cos[6-\tan(2x)]+e^{-x}\sqrt{5+x}$

(8) $l(x)=[\sec(4x)-\dfrac{1}{x}+x^{\pi^2}]^{10}$

[9] 4. Let $f(x)=\begin{cases} x+b & \text{if} \quad x<0 \\ \cos x & \text{if} \quad x\geq 0 \end{cases}$.

(a) Is there a value of b for which the limit of $f(x)$ at $x=0$ does exist? (Give reasons for your answer.)

(b) Is there a value of b that makes this function continuous at $x=0$? (Give reasons for your answer.)

(c) Is there a value of b that makes this function differentiable at $x=0$? (Give reasons for your answer.)