Math 21A
Kouba
Challenge Discussion Sheet 10

1.) Evaluate the following limits..

a.) $\lim_{x\to\infty} \dfrac{x^2-3x+5}{5x^2+7x-8}$ b.) $\lim_{x\to 1^+} \left(\dfrac{1}{x-1}-\dfrac{1}{\ln x}\right)$ c.) $\lim_{x\to\infty} (\ln(x+100)-\ln(x+25))$

d.) $\lim_{x\to 0} \dfrac{x^2}{\ln(\sec x)}$ e.) $\lim_{x\to 0} \dfrac{\sin x - x\cos x}{x - x\cos x}$ f.) $\lim_{x\to 0^+} x\ln x$

g.) $\lim_{x\to\infty} \dfrac{x^5}{e^{x^3}}$ h.) $\lim_{x\to\infty} \dfrac{x^5}{e^x}$ i.) $\lim_{x\to 0} \dfrac{(\sin 4x)(\sin 3x)}{x\sin 2x}$

2.) Let $y = f(x)$ be a differentiable and one-to-one function. Derive a formula for the derivative of the inverse function $y = f^{-1}(x)$.

3.) Differentiate each function. Do not simplify answers.

a.) $y = \arcsin(x^2\ln x)$ b.) $y = \arctan\sqrt{\dfrac{3-x}{x^2+5}}$

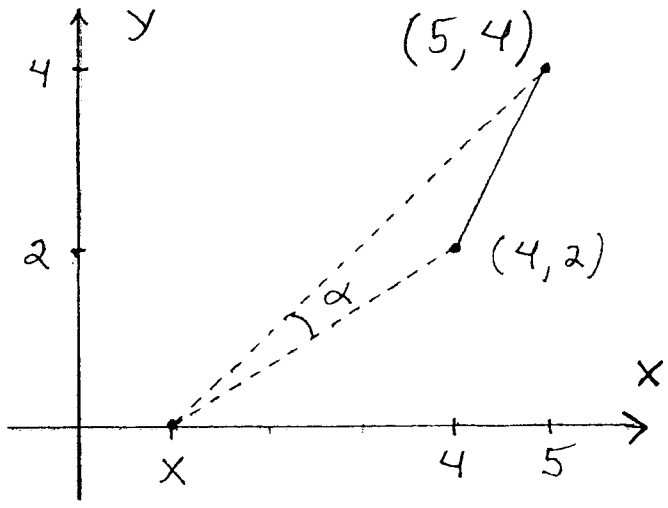
c.) $g(x) = 5^x \cdot \arccos(5^x)$ d.) $y = (\arctan(\arcsin(e^{\arccos x})))^3$

4.) Consider the given diagram below. Evaluate each limit intuitively.

a.) $\lim_{x\to\infty} \alpha$ b.) $\lim_{x\to-\infty} \alpha$ c.) $\lim_{x\to 3} \alpha$

Write angle α as a function of x.
Determine x so that α is an absolute

c.) minimum. d.) maximum.



5.) For what values of the constants a and b is $\lim_{x\to 0}(x^{-3}\sin 3x + ax^{-2} + b) = 0$