NAME _____ TA'S NAME _____

STUDENT ID _____ SECTION _____

Math 124K
Autumn 2012

Midterm 1
October 23, 2012

Point totals are indicated in parentheses. You must show your work to receive credit. You do not need a calculator for any of the problems; consequently, you will not receive credit for any solution based on calculator computations.

(18) 1. Evaluate the following limits:

a. $\lim_{x \to 2} \dfrac{\frac{1}{x} - \frac{1}{2}}{x - 2}$

b. $\lim_{t \to -\pi/2} \dfrac{\sin t + \sqrt{\sin^2 t + 2\cos^2 t}}{2\cos^2 t}$

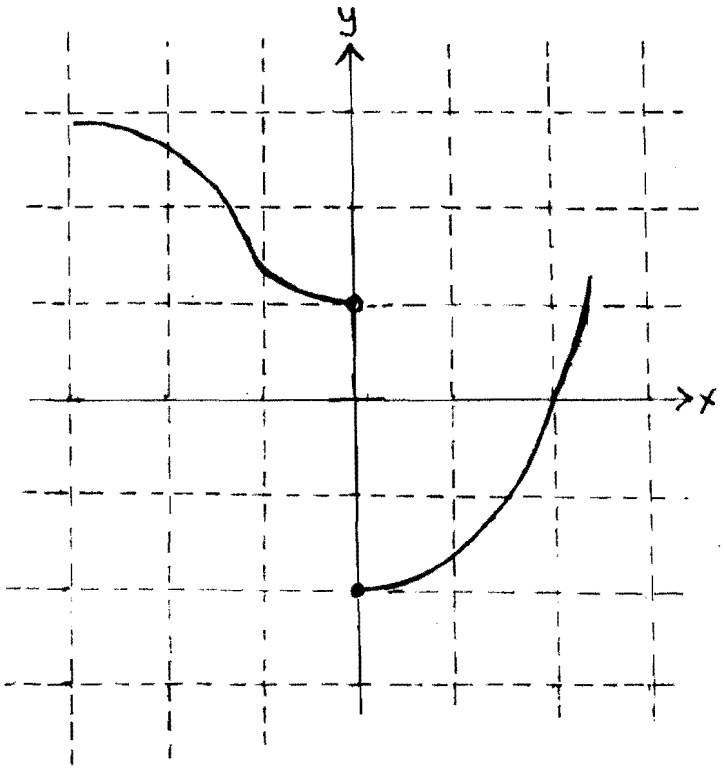
c. $\lim_{h \to \infty} \dfrac{\frac{1}{3h^2+1} - \frac{1}{h^2}}{\frac{1}{h^2} - \frac{1}{h^3}}$

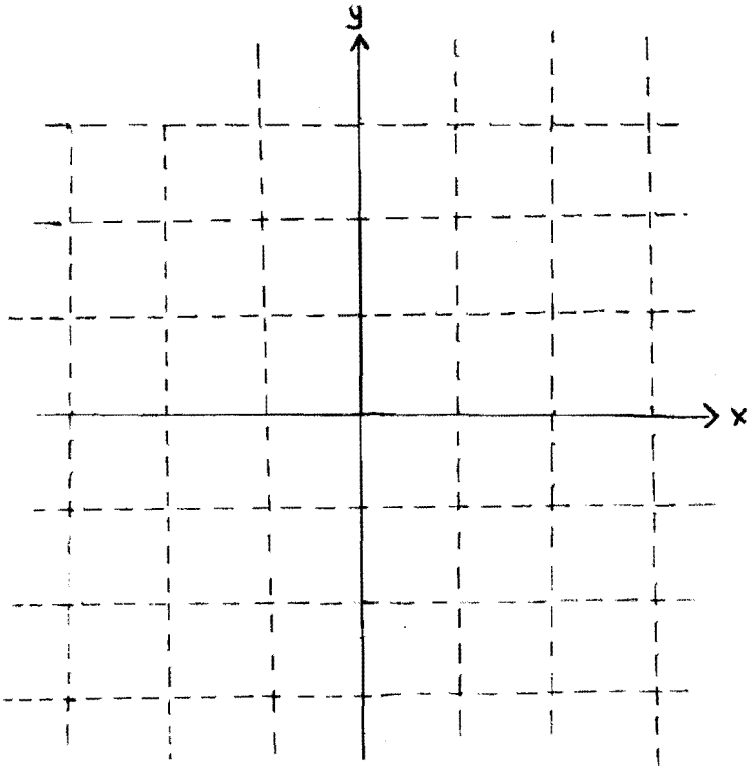
(8) 2. The only information known about two functions f and g is that $f(0) = 4 = g(0)$ and that $f'(0) = -1$, $g'(0) = 3$. Using just this information about f and g, compute the following limits.

a. $\lim_{h \to 0} \dfrac{f(h)g(h) - 16}{h}$

b. $\lim_{h \to 0} \dfrac{2h(f(h) - 4)}{(g(h) - 4)^2}$

(10) 3. The graph of a function f is shown below. Use this graph to estimate $f'(-2)$, $f'(-1)$, $f'(0)$, $f'(1)$, and $f'(2)$. (If any of these derivatives don't exist, explain why.) Then sketch the graph of the derivative function f'.





(8) 4. Find the equation of the tangent line to the curve $y = 5x/(\sin x + \cos x)$ at the point $(\pi, -5\pi)$.

(12) 5. A particle is traveling along the x-axis. Its position at time t is given by $s(t) = (t^2 - 3)e^t$, $-\infty < t < \infty$.

a. Find all times when the instantaneous velocity of the particle is 0.

b. Find all times when the particle is moving to the left.