SAMPLE EXAM 1 MAT 131 2/20/01

The first midterm is 8:30pm-10:00 pm on Tuesday, Feb 20. The locations are :

Location	Sections
Old Chemistry 116	1,2,5
Harriman hall 137	3,4,6
Old Enginering 143	7,8

1. Find the equation of the line passing through the points $(-1,3)$ and $(4,2)$.
2. Where do the lines $y = 2x - 1$ and $y = 3x + 10$ intersect?
3. Solve this equation for t in terms of a and b: $2at + 3t + 1 = b$.
4. Simplify the following expression as much as possible: $a^3(ab)^2/(ba^3)$.
5. Simplify the folloiwing expression as much as possible: $\log_3(27x^2)$.
6. What is the natural domain of definition of $f(x) = \sqrt{x + \frac{1}{x}}$?
7. Find all x which satisfy $\frac{1}{3}|x-2| < 1$. Give the answer as an interval.
8. On what intervals (if any) is the polynomial $p(x) = x^2 - 5x + 6$ negative?
9. Suppose θ one of the acute angles of a right triangle and assume $\sin(\theta) = \frac{1}{3}$. What is $\cos(\theta)$?
10. Find each of the following limits or explain why it does not exist.
    (a) $\lim_{x\to 0} \frac{x+1}{x-1}$.
    (b) $\lim_{x\to 1} \frac{x+1}{x-1}$.
    (c) $\lim_{x\to\infty} \frac{x+1}{x-1}$
    (d) $\lim_{x\to 0} \frac{|x|}{x}$.
    (e) $\lim_{x\to 0} \frac{x^2}{2x}$.
    (f) $\lim_{x\to 2} x^2 - 4$.
    (g) $\lim_{x\to 0} x^2 \cos(1/x^2)$.
    (h) $\lim_{x\to\infty} x \cos x$.
    (i) $\lim_{x\to 1}(x-1)^{-2}$.
11. For what value(s) of a does $\lim_{x\to 1} \frac{x^2-ax-1}{x-1}$ exist?
12. Sketch a function f on the interval $[0,5]$ which has the following properties.
    (a) f is increasing on $(0,2)$ and $(3,5)$.
    (b) f is decreasing on $(2,3)$.
    (c) f is continuous everywhere on $[0,5]$ except the points $\{2,3,4\}$ where it is discontinuous.
    (d) f has limits everywhere except the points $\{2,4\}$.
    (e) f is continuous from the right at $x = 4$.
    (f) f never attains a maximum value on $[0,5]$.
13. State the intermediate value theorem.
14. State the squeeze theorem.
15. Suppose f is increasing on an interval (a,b) and has a limit at a point $c \in (a,b)$. Must f be continuous at this point c?