For test 1 we have material from the preliminary chapters and from chapter 1 on limits. To study for the exam you should have a) gone over your lecture notes b) read the chapters c) gone over your quizzes d) tried the homework. Here are some *possible* question types. Be very surprised if any of these questions were to appear on the exam. Also do not be surprised if there are many other different question types on the exam.

1. Write an equation that has these solutions $(-1, 0)$, $(1, 0)$, $(0, -1)$, $(0, 1)$.
2. Sketch a graph of the equations

$$y^2 = x, \quad x^2 + y^2 = 1$$

   Circle the points which solve both equations
3. Find the equation of a line through $(-1, 1)$ with slope -2
4. Find the equation of the line through $(-1, 1)$ and $(2, 3)$.
5. Find the equation of the line that is both perpendicular to the x-axis and goes through the point $(-1, 1)$.
6. Find any line perpendicular to the line $y = 3x + 4$. For you line, what is the point of interesection between the two?
7. For the function $f(x) = x^2$ evaluate the following (simplify if you can)
   (a) $f(2 + 3)$
   (b) $f(2 + h)$
   (c) $(f(x + h) - f(x))/h$
8. Write the function $h(x) = \sqrt{x^2 - 2}$ in terms of a composition of functions.
9. What is the difference between the graph of a function and the graph of an equation?
10. Sketch the graph of a function which is even
11. Sketch the graph of an odd function
12. Sketch the graph of a function which is not one-to-one
13. Use a graphing calculator to graphically investigate the limit

$$\lim_{x \to 0} \frac{\sqrt{x + 3} - \sqrt{3}}{x}$$

   what is your answer?

14. Use a table of values to investigate the limit

$$\lim_{x\to 0} \frac{1-\cos(x)}{x^2}$$

(Why is it useful to note this is an even function?)

15. Suppose you remember the limit of $\sin(x)/x$ goes to 1 as x goes to 0. What is the limit

$$\lim_{x\to 0} \frac{x}{\sin(2x)}$$

Why!

16. Sketch a graph of a function which does not have a limit at the point c but has a left and right limit at c

17. Sketch a graph of a function with no limit, left limit or right limit at c but is defined around c. (oscillate!)

18. Solve analytically

$$\lim_{x\to 3} \frac{x^2-x-2}{x-2}, \quad \lim_{x\to 2} \frac{x^2-x-2}{x-2},$$

19. If $f(x) = x^3$ find analytically

$$\lim_{h\to 0} \frac{f(1+h)-f(1)}{h}$$

20. Explain why you know that you can "plug in" to answer

$$\lim_{x\to 3} \sqrt{x^3-3x+2}$$

21. Sketch an $\epsilon - \delta$ "box" and a function which does not satisify if $0 < |x-c| < \delta$ then $|f(x)-L| < \epsilon$.

22. Draw a function which has a limit at c but is not continuous.

23. Explain why you can not draw a function which is continuous at c but has no limit at c.

24. Which values of c will the function

$$f(x) = \frac{x^2+3x-2}{x-3}$$

not be continuous. Why?

25. Draw a function which is right continous at c, has left limits at c but is not continuous at c. (Just for fun, you can imagine functions which are not continuous at any point.)

26. Continuity implies things about functions. The intermediate value thereom says that some value exists. Explain why this means that a continuous function which is negative at $x = 0$ and positive at $x = 1$ **must** have a zero in $[0, 1]$. Does it help you find it?

27. Sketch a graph with a horizontal asymptote as x goes to ∞.

28. Sketch a graph of a function with a vertical asymptote at $x = 2$.

29. The function $f(x) = 1/x^2$ has a limit of infinity as x goes to 0. Does it have a limit as x goes to 0?