The tests are cummulative and can include Pre-Calculus material mentioned in the MATH 2301 Calculus I handbook. This guide gives some sample questions for Sections 1.3, 1.4, and 1.5. In some cases part of the problem is deciding which method to use, so you may be able to do the problem using methods from earlier sections. Doing these problems does not replace doing homework problems.

1. Consider the function
$$f(x) = \begin{cases} x^2 & \text{if } x \leq -2 \\ Ax & \text{if } x > -2 \end{cases},$$
where A is some constant.

   (a) Find $\lim_{x \to -2^-} f(x)$. Is f continuous from the left at $x = -2$?

   (b) What value of A would make f continuous at $x = -2$?

   (c) Using the value of A that you just found, graph f.

   [Tests one-sided limits (Sections 1.3 and 1.4) and the concept of continuity (1.5).]

2. Use the Intermediate Value Theorem to show that the equation $x^2 = \cos(x)$ has a solution.
   [Tests the concept of continuity (1.5) and its use in the Intermediate Value Theorem.]

3. Compute the following limits. If you use the squeeze theorem, then indicate the two functions that you are using to squeeze.

   (a) $\lim_{x \to 2} \dfrac{x-2}{x^2 - 5x + 6}$

   (b) $\lim_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$

   (c) $\lim_{x \to 0} x^2 \cos(3/x)$

   (d) $\lim_{h \to 0} \dfrac{x^2 - (x - 2h)^2}{h}$

   (e) $\lim_{t \to 0} \dfrac{\frac{1}{5+t} - \frac{1}{5}}{t}$

   [Tests the computation of limits (1.4).]

4. Sketch the graph of a single function f that:

   - has domain $[-4, 5]$
   - has $f(2) = 1$
   - has $\lim_{x \to 2} f(x) = 4$
   - has $\lim_{x \to 3^+} f(x) = -3$
   - has $\lim_{x \to 3^-} f(x) = 3$
   - is continuous except possibly at $x = 1$, $x = 2$, and $x = 3$

   [Test graphical understanding of limits and continuity (1.3, 1.5).]