Topics and HW problems that were covered with sample questions from old tests. You may use graphing calculators except the TI-89 or 92.

1. Graph piecewise defined function. P 23 37, 39,40
2. Given a graph find the limit, the function value. P 102 4 – 9; P 146 3
3. Evaluate the given limit as $x \to$ constant. P 103 23 – 30; P 112 3, 5, 6 – 9 all, 11, 12, 13, 15, 16, 19, 24
4. Evaluate the given limit as $x \to$ constant using the conjugate. P 112 21, 23, 27
5. Evaluate the given limit as $x \to$ constant for the absolute value cases. P 112 39, 41, 44, 47
6. Evaluate the given limit as $x \to$ constant for a piecewise defined function. P 112 45, 48
7. Evaluate the given limit as $x \to \infty$. P 146 11 – 23 odds, 24, 27, 29, 31, 33
8. Find an equation of the tangent line to the curve at the given point using the derivative. (Find the derivative using the limit.)P 156 5a, b; P 174 21, 23, 31
9. Given a graph determine if the function is continuous at a given value ($x = a$). Use the 3 steps from definition of continuity. P 133 3a
10. Given a graph determine if the function is one-sided continuous at a given value ($x = a$). Use the 3 steps from definition of continuity. P 133 3b
11. Use the 3 steps from definition of continuity to show that the given function is continuous at a given value ($x = a$). P 133 11, 12
12. Given a function explain why the function is discontinuous at a given value ($x = a$). P 133 15, 17, 19

OLD TEST QUESTIONS (These are provided for extra practice. Your test will not be a carbon copy of these questions.)

1. For the function $f$ whose graph is given, state the value of the given quantity at the right, if it exists.
   a) $f(0)$ b) $\lim_{x \to 0^-} f(x)$
   c) $\lim_{x \to 0^+} f(x)$ d) $\lim_{x \to 0} f(x)$
   e) $f(2)$ f) $\lim_{x \to 2^-} f(x)$
   g) $\lim_{x \to 2^+} f(x)$ h) $\lim_{x \to 2} f(x)$

2. Evaluate the given limits. a) $\lim_{x \to 3} \frac{4-x}{x-3}^2$ b) $\lim_{x \to 4} \ln(x-4)$ c) $\lim_{x \to \frac{\pi}{2}} \sec x$

3. Evaluate the given limit. $\lim_{x \to 4} \frac{\sqrt{x} - 2}{x^2 - 16}$

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4. Evaluate the limits for the given function. \( f(x) = \frac{x^2 - 25}{|x - 5|} \)
   a) \( \lim_{x \to 5^+} f(x) \)  
   b) \( \lim_{x \to 5^-} f(x) \)  
   c) \( \lim_{x \to 5} f(x) \)

5. Evaluate the limits for the given piecewise defined function. \( f(x) = \begin{cases} -x & x < 0 \\ x^2 & 0 \leq x < 3 \\ x + 1 & x \geq 3 \end{cases} \)
   a) \( \lim_{x \to 0^+} f(x) \)  
   b) \( \lim_{x \to 0^-} f(x) \)  
   c) \( \lim_{x \to 0} f(x) \)  
   d) \( \lim_{x \to 3^+} f(x) \)  
   e) \( \lim_{x \to 3^-} f(x) \)  
   f) \( \lim_{x \to 3} f(x) \)

6. Evaluate the given limits.
   a) \( \lim_{x \to \infty} \frac{4 - x + 7x^3}{8x^3 - 11} \)  
   b) \( \lim_{x \to -\infty} (20 - x + 7x - 6x^2 + 10x^5) \)  
   c) \( \lim_{x \to \infty} \frac{x^2 - 8x - 9}{x^4 - 16} \)

7. Graph the following piecewise function. \( f(x) = \begin{cases} x^2 + 3 & x \geq 0 \\ -1 & x < 0 \end{cases} \)

8. For the piecewise function from #2 \( f(x) = \begin{cases} x^2 + 3 & x \geq 0 \\ -1 & x < 0 \end{cases} \) find the following values.
   a) \( f(0) \)  
   b) \( \lim_{x \to 0^+} f(x) \)  
   c) \( \lim_{x \to 0^-} f(x) \)  
   d) \( \lim_{x \to 0} f(x) \)

9. For the piecewise function from #2 \( f(x) = \begin{cases} x^2 + 3 & x \geq 0 \\ -1 & x < 0 \end{cases} \) show that it is not a continuous function. If the function is one-sided continuous, use the 3 steps from the definition of continuity to prove it.

10. For the piecewise function from #2 \( f(x) = \begin{cases} x^2 + 3 & x \geq 0 \\ -1 & x < 0 \end{cases} \) Is the function continuous at \( x = -5 \)?
    Use the 3 steps from definition of continuity to prove it.

11. Find the equation of the tangent line to the curve \( f(x) = x^2 + x \) at the point \((2, 6)\) using the derivative.
    (Show the derivative using the limit \( \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \) .) You must your work.