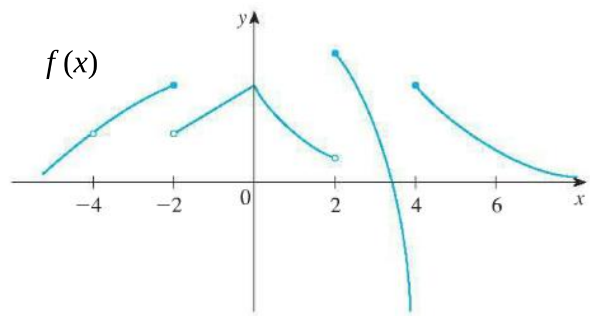
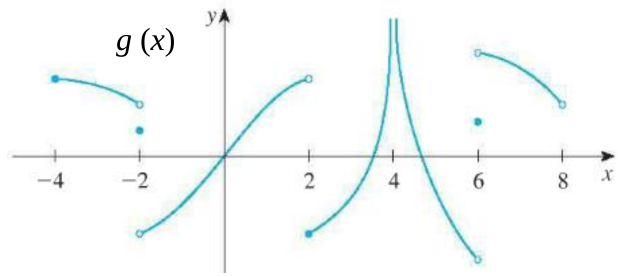
MAT 201 Section 1.8 questions 1/23/15

1. Write an equation that expresses the fact that a function f is continuous at the number 4.
2. (a) From the graph of f, on the right, state the numbers at which f is discontinuous and explain why.
   (b) For each of the numbers stated in part (a), determine whether f is continuous from the right, or from the left, or neither.



3. From the graph of g, on the right, state the intervals on which g is continuous.



4. Sketch the graph of a function that is continuous except for a removable discontinuity at $x = 3$ and a jump discontinuity at $x = 5$.
5. Use the definition of continuity and properties of limits to show that $f(x) = \left(x + 2x^3\right)^4$ is continuous at $x = -1$.

#s 6 - 8 Explain why the function is discontinuous at the given number, a. Sketch the graph of the function.

6. $a = -2,\ f(x) = \dfrac{1}{x+2}$

7. $a = 1,\ f(x) = \begin{cases} -x^2 + 1 & \text{if } x < 1 \\ \dfrac{1}{x} & \text{if } x \geq 1 \end{cases}$

8. $a = 0,\ f(x) = \begin{cases} \cos(x) & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ -x^2 + 1 & \text{if } x > 0 \end{cases}$

9. Find the numbers, a, at which $f(x) = \begin{cases} x^2 + 1 & \text{if } x \leq 0 \\ -x + 2 & \text{if } 0 < x \leq 2 \\ (x-2)^2 & \text{if } x > 2 \end{cases}$ is discontinuous. At which of these numbers is f continuous from the right, from the left, or neither? Sketch the graph of f.

10. For what values is g continuous, if $g(x) = \begin{cases} 0 & \text{if } x \text{ is rational} \\ x & \text{if } x \text{ is irrational} \end{cases}$? This one is pathological in conception and construction. But it gets at some of the subtleties involved, and why we're so careful in our theorem and definition statements. Can't let one of these guys fall through the cracks, with something a little too haphazard…