Math 130 Day 12

Office Hours (LN 301/301.5): M 3:30-4:30, Tu 11:00-1:00, W 12:15-1:15, F 1:30-2:30. Other times by appointment. **Math Intern:** Sun through Thurs: 3:00–6:00, 7:00–10:00pm. **Website:** Use the links at the course homepage on **Canvas** or go to my course Webpage: `http://math.hws.edu/~mitchell/Math130F16/index.html`.

Test on Monday

☞ The exam is in **Albright Auditorium**. It starts at **7:40 am** for Section 01 and **8:45 am** for Section 02. Review the following definitions, which you will need to use. **You will be asked to state some of these.**

1. The line $x = a$ is a **vertical asymptote** (VA) of f if either $\lim_{x\to a^+} f(x) = +\infty$ or $-\infty$ AND/OR $\lim_{x\to a^-} f(x) = +\infty$ or $-\infty$.

2. The line $y = L$ is a **horizontal asymptote** (HA) for the graph of $f(x)$ if either $\lim_{x\to+\infty} f(x) = L$ or $\lim_{x\to-\infty} f(x) = L$.

3. f is **continuous** at a if $\lim_{x\to a} f(x) = f(a)$. This means (continuity checklist)

1. $f(a)$ is defined (i.e., a is in the domain of f).
2. $\lim_{x\to a} f(x)$ exists.
3. $\lim_{x\to a} f(x) = f(a)$.

4. A function f is **left-continuous** at a if $\lim_{x\to a^-} f(x) = f(a)$ and f is **right-continuous** at a if $\lim_{x\to a^+} f(x) = f(a)$.

5. **Removable Discontinuity**. A function f has a **removable discontinuity** (RD) at a if the following hold:
1) $\lim_{x\to a} f(x)$ exists (and is finite).
2) $\lim_{x\to a} f(x) \neq f(a)$. Note: $f(a)$ may not even exist.

6. You should know how to evaluate many types of limits, including
a) indeterminate limits of the form 0 over 0 that require more work (e.g., factoring, using conjugates)
b) limits that become infinite (numerator is not 0, the denominator $\to 0^+$ to 0^-)
c) limits at infinity (using highest powers, be careful of square roots and absolute values in such cases)
d) limits involving continuous functions (polynomial, rational, trig, exponential, log)

7. Using limits to determine
a) vertical and horizontal asymptotes (use the definitions)
b) determine whether a function is continuous or left and/or right continuous at a (use the definition)

8. Intervals of continuity. Filling in tables of describing limit and continuity details of functions from a graph or from the information given in the table.

9. Review secant slope and tangent slope (limit of secant slope) and the corresponding notions of average and instantaneous velocity.

10. Recognize polynomial and rational functions.

11. You should be able to do a simple limit 'proof' using the formal ε and δ method. See Lab 4 and Class notes from Wednesday. There are more examples in the online notes.

12. You should be able to use the Intermediate Value Theorem to show that an equation has a solution. What conditions must you check? See Lab 4 and/or the online notes for good examples.

13. Try the **Practice Problems** online (answers posted Friday afternoon) and previous labs (answers online) for examples of actual problems. All the **homework answers** are online.

Reading and Practice

For Wednesday Read/Review Chapter 3.1 and read Chapter 3.2.

1. a) Close Reading: Memorize the definition of $f'(x)$ (using $h \to 0$) on page 130.

2. If $f(x) = 2x^2 - 4x$ use the definition of the derivative to calculate $f'(x)$. Find the equation of the tangent line to f when $x = 3$. When is the the tangent slope 0? (Answers: $f'(x) = 4x - 4$, $y = 8x - 18$, and $x = 1$.)

3. Page 133ff #1, 3, 5, 9, 13, 29 and 31.

Hand In: Name: ______________________

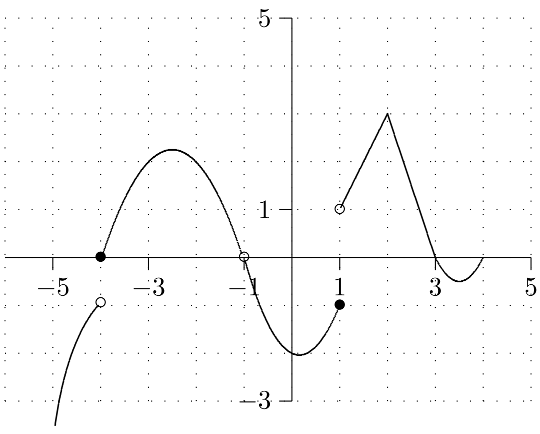
WeBWorK Day 12 due Wednesday night.

1. a) Close Reading Exercise 1. You should have read Section 3.1 and 3.2 carefully. Not every function has a derivative at every point. In Section 3.2 the authors give the equations of at least two functions that do not have derivatives at particular points. State the equations of two such functions from your text and the corresponding points.

1) **2)**

b) From your reading in Chapter 3.2, sketch your own graph of a function that is continuous at $x = 1$ but not differentiable there. Explain what goes wrong. You may modify an example in the text.

2. a) Close Reading Exercise 2. Now carefully read Theorem 3.1 on page 138 and then the version on page 139. Use the graph below plus Theorem 3.1, plus the work in the previous question to fill in the table. Note: There is a hole at -1.



a	Continuous?	Differentiable?
-4		
-2.5		
-1		
0		
1		
2		
3		

b) When f was NOT continuous at a what did you find in the table above?