Problem Set 1

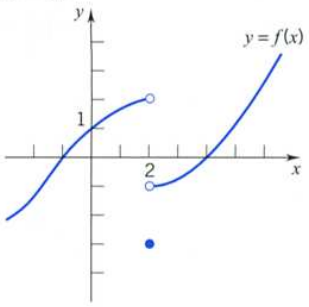
Tuesday, January 24

I. Problems to be graded on completion.

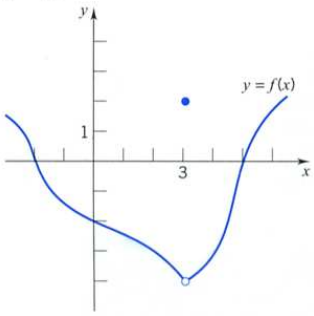
- In each problem below you are given a number c and the graph of a function f. Find

  (a) $\lim_{x \to c^-} f(x)$ (b) $\lim_{x \to c^+} f(x)$ (c) $\lim_{x \to c} f(x)$ (d) f(c)

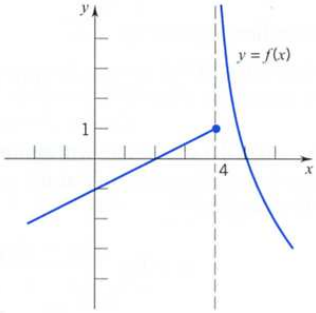
1. $c = 2$.



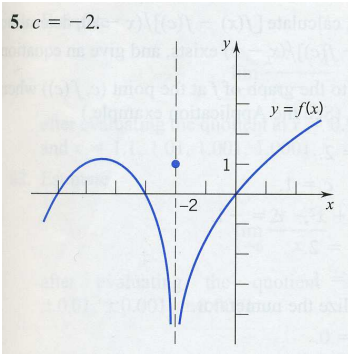
2. $c = 3$.



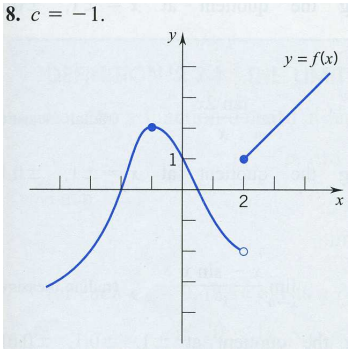
4. $c = 4$.



5. $c = -2$.



8. $c = -1$.

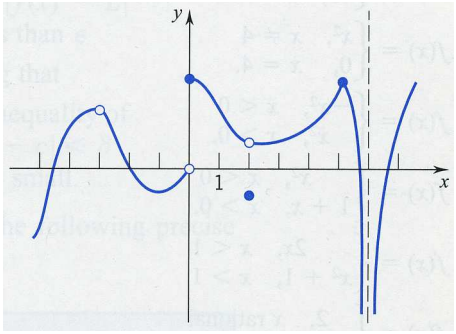


- §2.4 #8, 10, 14.
- §2.6 #6, 22. Read the directions.
- §2.9 #28, 30, 32, 36. "Right continuous" is the same thing as "continuous from above."

II. Problems to be graded on correctness.

1. Evaluate
$$\lim_{x\to 4}\left[\frac{\sqrt{x}-2}{(x-4)^2}-\frac{1}{x^2-4x}\right].$$
Give an exact answer, not a decimal. If you know l'Hôpital's rule, do not use it. Hint: The limit does exist and it is not zero. Further hint: $x-4=(\sqrt{x})^2-2^2$.

2. Describe the behavior of the function below. Where is it continuous? Where it is discontinuous, what can you say about the limits from each side? Model your answer on the example given in class on Friday.



3. §2.5 #28.
4. Suppose that x and y are two numbers for which $|x-y|<\epsilon$ for every $\epsilon>0$. Prove that $x=y$.
5. Recall that the following thing is called Pascal's triangle:

$$\begin{array}{ccccccccccc}
 & & & & 1 & & & & & & \\
 & & & 1 & & 1 & & & & & \\
 & & 1 & & 2 & & 1 & & & & \\
 & 1 & & 3 & & 3 & & 1 & & & \\
1 & & 4 & & 6 & & 4 & & 1 & & \\
1 & & 5 & & 10 & & 10 & & 5 & & 1
\end{array}.$$

Each entry is the sum of the two entries above it—for example, $10=6+4$.

(a) Write out Pascal's triangle with two more rows.
(b) Expand $(x+y)^2$ by foiling. Do the same for $(x+y)^3$ and $(x+y)^4$.
(c) Without foiling, guess what the expansion of $(x+y)^7$ will be.