# QUIZ #1 (SAMPLE QUESTIONS)

**Show all work, simplify as appropriate, and use "good form and procedure" (as in class).**
**Box in your final answers; write units where appropriate!**
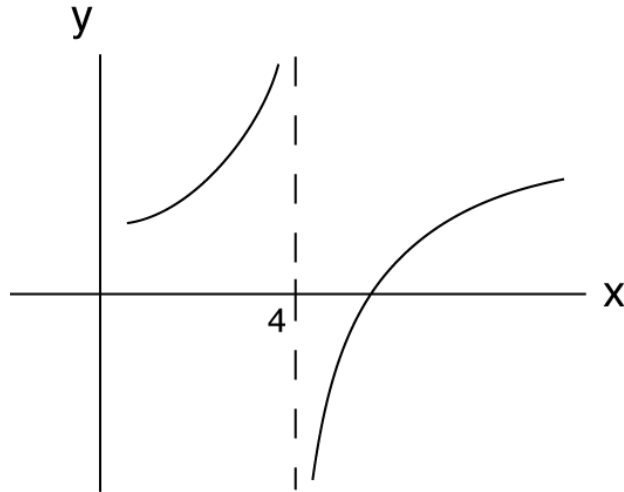**No notes or books allowed.**

## PART 1 (NO CALCULATORS!)

1) Find the following limits <u>without</u> making a table. Write $\infty$ or $-\infty$ when appropriate. If a limit does not exist, and $\infty$ and $-\infty$ are inappropriate, write "DNE". **Box in your final answers.** (13 points total)

a)  $\lim\limits_{x \to -2} \dfrac{x}{x+1}$           (2 points)

b)  $\lim\limits_{x \to 3} \dfrac{x^2 - 8x + 15}{x - 3}$           (5 points)

For problems c) through e), refer to the graph of $f$ below.
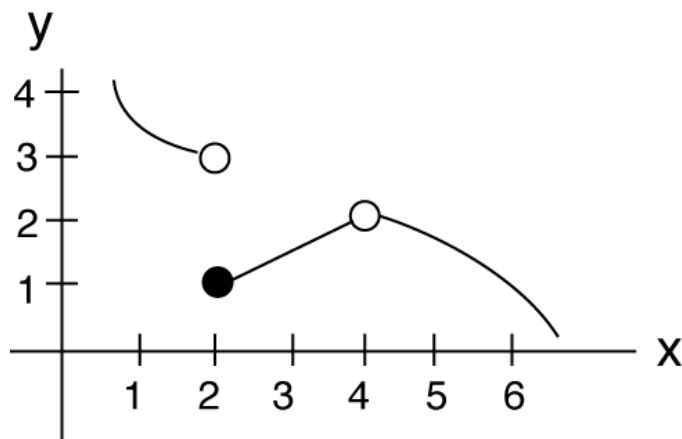Answer only is fine.



c) $\lim\limits_{x \to 4^+} f(x)$ (1 point)

d) $\lim\limits_{x \to 4^-} f(x)$ (1 point)

e) $\lim\limits_{x \to 4} f(x)$ (1 point)

For problems f) through h), refer to the graph of $f$ below.
Answer only is fine.



f) $\lim\limits_{x \to 2^-} f(x)$ (1 point)

g) $\lim\limits_{x \to 2} f(x)$ (1 point)

h) $\lim\limits_{x \to 4} f(x)$ (1 point)

2) Let $f(x) = \dfrac{3x+2}{x^3 - 16x}$. Give all $x$-values where $f$ is discontinuous. (5 points)

3) A function $f$ is continuous at $c$ if and only if the following three conditions hold:
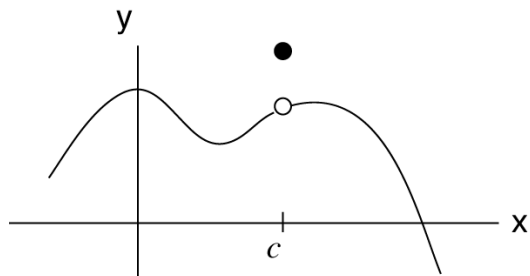
   Condition 1) $f(c)$ is defined.
   Condition 2) $\lim\limits_{x \to c} f(x)$ exists.
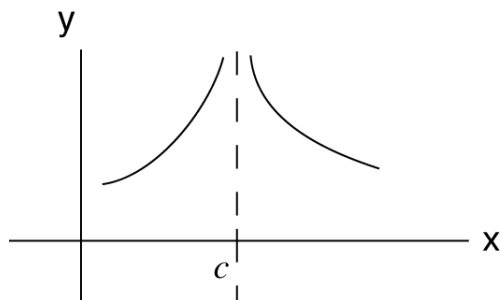   Condition 3) $\lim\limits_{x \to c} f(x) = f(c)$.

   In the graphs below, $f$ is **not** continuous at $c$. For each graph, indicate the <u>first</u> of the above three conditions (1, 2, or 3) that fails. (6 points total; 2 points each)



   _____



   _____



   _____
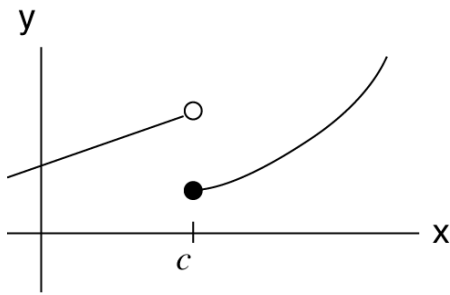
4) Let $f(x) = 4x^2 + 5$. Find $f'(x)$ using the limit definition of derivative. Show all steps! (10 points)

5) Let $f(x) = 5x^4 - \dfrac{1}{x^2} + \sqrt[5]{x^3}$. Find $f'(x)$. Your final answer must have only positive exponents. (6 points)

# PART 2 (USE A SCIENTIFIC CALCULATOR!)

6) The population $P$ of Springfield $t$ years after January 1, 1990 $(0 \leq t \leq 13)$ is given by $3t^2 + 500$. You do <u>not</u> have to use the limit definition of derivative. Write units.

   a) What is the average rate of change of Springfield's population between January 1, 1995 and January 1, 2000?

   b) What is the instantaneous rate of change of Springfield's population on January 1, 2000?

   c) What is the population of Springfield on January 1, 2000?