Exam 1   Calc 1   9/21/2012

Each problem is worth 10 points. For full credit provide complete justification for your answers.

Use the graph of $g(x)$ at the bottom of the page for problems 1 through 3:

1. Find the following limits:
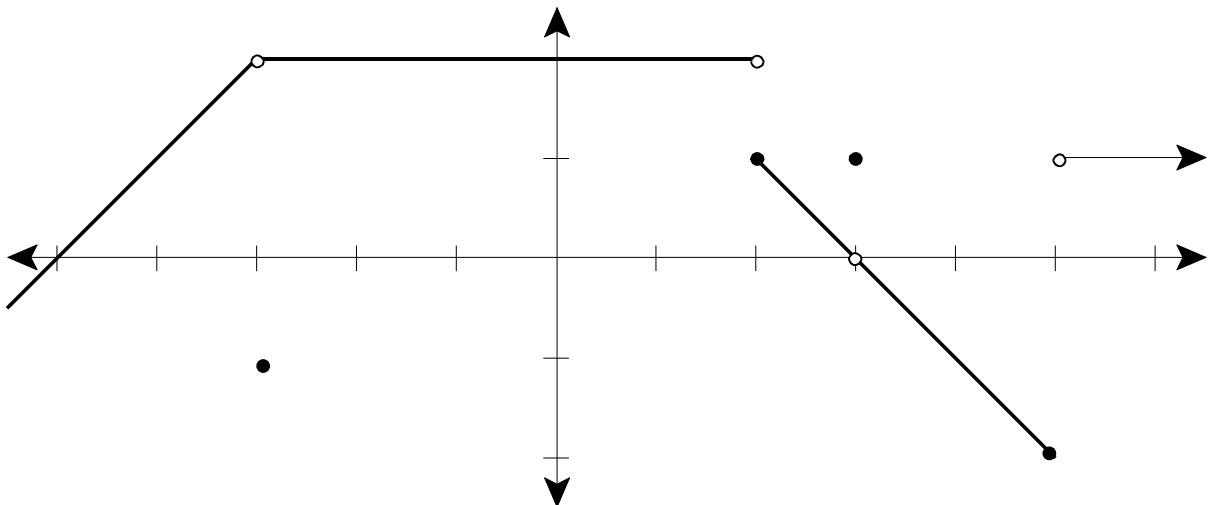   a) $\lim\limits_{x \to 3^-} g(x)$
    b) $\lim\limits_{x \to 3^+} g(x)$
    c) $\lim\limits_{x \to 3} g(x)$
    d) $\lim\limits_{x \to 5^+} g(x)$
    e) $\lim\limits_{x \to 5} g(x)$

2. For which values of x does the function fail to be continuous?

3. Find a slope function for $g(x)$.

4. Suppose that $f(x) = \begin{cases} 4 & \text{for } x < 1 \\ -2x & \text{for } x = 1 \\ 10 + x & \text{for } x > 1 \end{cases}$. Evaluate the following, and make it clear how you arrived at your answers:

a) $\lim\limits_{x \to 1^+} f(x)$

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

c) $\lim\limits_{x \to 1} f(x)$

5. Evaluate $\lim\limits_{x\to3}\dfrac{x^2-x-6}{x-3}$.

6. Evaluate $\lim\limits_{x\to\infty}\dfrac{3x^2}{x^3-2x+1}$.

7. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Crap. I did good in math in high school, but now instead of formulas, they throw stuff at us where there's only words and symbols and stuff. On our review problems for the test there was this one here, and I've got no clue how to work it out.

Help Biff by explaining as clearly as you can what the answers to these questions should be **and why**.

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7. Suppose you know $f(x)$ is continuous at 1 and that $\lim\limits_{x \to 1^-} f(x) = 7$. Which of the following can you conclude?

(A) $\lim\limits_{x \to 1^+} f(x) = 7$

(B) $\lim\limits_{x \to 1} f(x) = 7$

(C) $f(1) = 7$

(D) $\lim\limits_{x \to 1} f(x) \neq 7$

(E) None of the above *must* be true

(F) More than one of the above *must* be true

8. Suppose you know $f(x)$ is *not* continuous at 2 and that $\lim\limits_{x \to 2^-} f(x) = 7$. Which of the following can you conclude?

(A) $\lim\limits_{x \to 2^+} f(x) = 7$

(B) $\lim\limits_{x \to 2} f(x) = 7$

(C) $f(2) = 7$

(D) $\lim\limits_{x \to 2} f(x) \neq 7$

(E) None of the above *must* be true

(F) More than one of the above *must* be true

8. Evaluate $\displaystyle \lim_{h \to 0} \frac{\sqrt{a^2 + h} - a}{h}$.

9. Evaluate $\displaystyle\lim_{x\to 1^+}\sqrt{\frac{x-1}{x-3}}$ and $\displaystyle\lim_{x\to 1^-}\sqrt{\frac{x-1}{x-3}}$.

10. Evaluate $\displaystyle \lim_{x \to -\infty} \frac{4x^3}{2x^3 + \sqrt{9x^6 + 15x^4}}$.

Extra Credit (5 points possible):

What can you say about $\lim\limits_{x \to \infty}\left(1+\dfrac{1}{x}\right)^{x}$?