

QUIZ #1 (SECTIONS 2.1, 2.2, 2.3)

MATH 121 – FALL 2003 – KUNIYUKI
105 POINTS TOTAL, BUT 100 POINTS = 100%

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!): 82 points

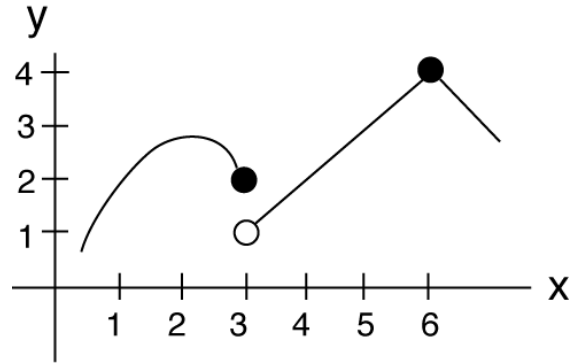
1) These instructions apply to questions a) through i):

Find the following limits without making a table. Write ∞ or $-\infty$ when appropriate. If a limit does not exist, and ∞ and $-\infty$ are inappropriate, write “DNE”. **Box in your final answers.** (16 points total)

a) $\lim_{x \rightarrow 2} \frac{x-2}{x^2+2x-8}$ (6 points)

b) $\lim_{x \rightarrow 2} \frac{x+3}{x-4}$ (3 points)

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



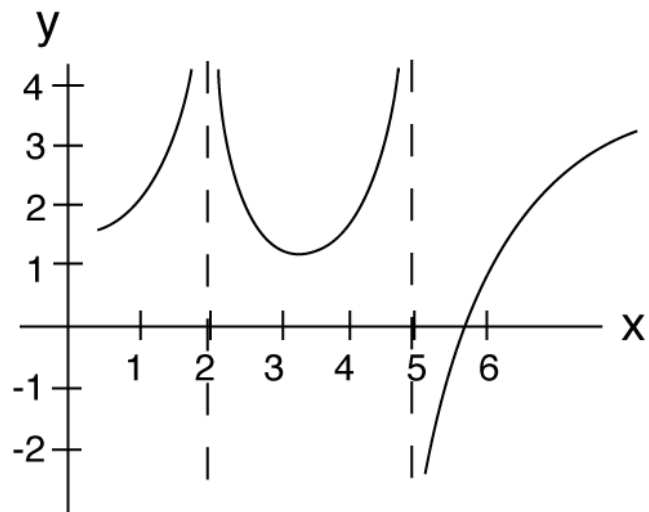
c) $\lim_{x \rightarrow 3^-} f(x)$ (1 point)

d) $\lim_{x \rightarrow 3^+} f(x)$ (1 point)

e) $\lim_{x \rightarrow 3} f(x)$ (1 point)

f) $\lim_{x \rightarrow 6} f(x)$ (1 point)

For problems g) through i), refer to the graph of the rational function f below.
 Answer only is fine.



g) $\lim_{x \rightarrow 2^-} f(x)$ (1 point)

h) $\lim_{x \rightarrow 5^+} f(x)$ (1 point)

i) $\lim_{x \rightarrow 5} f(x)$ (1 point)

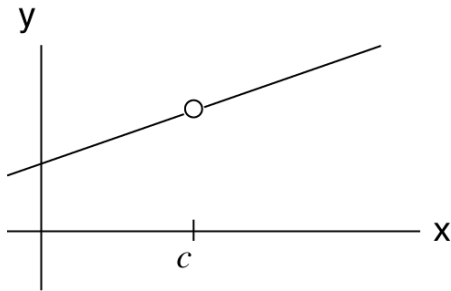
2) A function f is continuous at c if and only if the following three conditions hold:

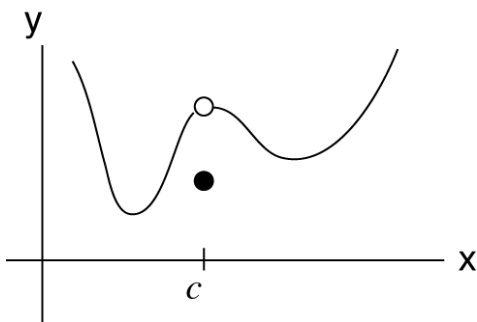
Condition 1) $f(c)$ is defined.

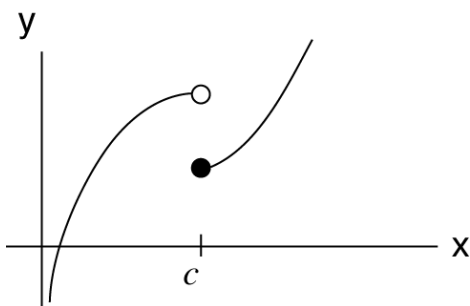
Condition 2) $\lim_{x \rightarrow c} f(x)$ exists.

Condition 3) $\lim_{x \rightarrow c} f(x) = f(c)$.

In the graphs below, f is not continuous at c . For each graph, indicate the first of the above three conditions (1, 2, or 3) that fails. (9 points total; 3 points each)







3) True or False: All polynomial functions of x are continuous at all real values of x . Circle one: (2 points)

True

False

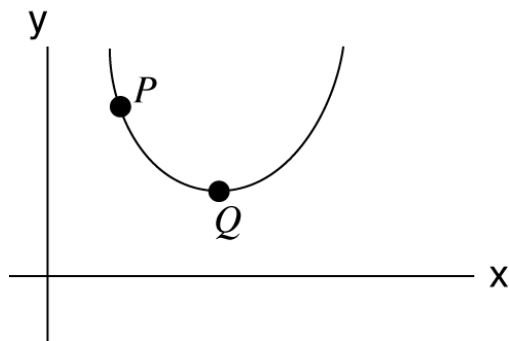
4) Let $f(x) = \frac{3x^2}{(x+9)(x-6)}$. Give all x -values where f is discontinuous. (3 points)

5) Let $f(x) = x^2 - 4x$. Find $f'(x)$ using the limit definition of derivative. Show all steps! (15 points)

6) Let $f(x) = \frac{5}{x}$. Find $f'(x)$ using the limit definition of derivative. Show all steps!
(15 points)

YOU MAY CONTINUE ON THE NEXT PAGE

Use the figure below to answer 7) and 8):



7) What is the slope of the tangent line at the point P ? Circle one: (2 points)

Positive

Zero

Negative

8) What is the slope of the tangent line at the point Q ? Circle one: (2 points)

Positive

Zero

Negative

9) If $f(x) = \frac{2}{x^7} - \sqrt[4]{x^3} + 4$, find $f'(x)$. Write your answer so that it has no negative exponents. (7 points)

10) If $f(x) = 5x^2 - 4x + 2$, find $f'(3)$. (4 points)

11) If $f(x) = \sqrt{x}$, find $\left. \frac{df}{dx} \right|_{x=9}$. (7 points)

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PART 2 (USE A SCIENTIFIC CALCULATOR!): 23 points

- 12) A company's profit function is given by $P(x) = 3x^2 - 4x - 400$ in dollars, where x is the number of units produced and sold. Find the marginal profit when 200 units have been produced and sold, and interpret your answer. (6 points)
- 13) The number of people living on Elm Street is given by $f(t) = 1000 - 0.4t^3$, where t is measured in days ($0 \leq t \leq 13$). Write units! (17 points total)
- a) Find the number of people on Elm Street at $t = 5$. (3 points)
- b) Find the average rate of change of the number of people on Elm Street from $t = 3$ to $t = 8$. (8 points)
- c) What is the instantaneous rate of change of the number of people on Elm Street at $t = 5$? (6 points)