

**Quiz 3 for Mathematics 223**  
**Introductory Analysis I - Fall 1999**  
**Material Covered: Sections 3.1, 3.2 of text and notes**  
**For: 8th October**

This is a 15 minute quiz, worth 6% and marked out of 6 points. The total possible points awarded for each question is given in square brackets at the beginning of each question. Anything that can fit on one side of an  $8\frac{1}{2}$  by 11 inch piece of paper may be used as a reference during this quiz. A calculator may also be used. No other aids are permitted.

Name (please print): \_\_\_\_\_ . ID Number: \_\_\_\_\_  
last first

1. [1] Function  $f(x) = \frac{x^2+2x-3}{4x+12}$  has a discontinuity at  $x = a = -3$ . To remove this discontinuity, define  $f(a) =$  (circle one) **-1.5 / -1.0 / 0 / 1.5 / 2.5**

2. [3] Consider the function

$$f(x) = \begin{cases} \frac{1}{5}x^2 & \text{if } x \leq 4 \\ 3 - x^2 & \text{if } x > 4 \end{cases}$$

(a) **True / False** At  $x = 0$ ,  $f(x)$  not only has a value,  $\lim_{x \rightarrow 0} f(x)$  exists, but also  $f(x)$  is both continuous and differentiable.

(b) At  $x = 4$ , however,  $f(x)$  is discontinuous

because \_\_\_\_\_.

(c) And the limit from the right,

$\lim_{x \rightarrow 4^+} f(x) =$  \_\_\_\_\_.

3. [2] The interval(s) on which  $f(x) = 2x^3 + 9x^2 - 60x$  is

increasing is/are: \_\_\_\_\_.

concave up is/are: \_\_\_\_\_.

1. [1] **-1.0**

$$\text{since } f(x) = \frac{x^2+2x-3}{4x+12} = \frac{(x-1)(x+3)}{4(x+3)} = \frac{x-1}{4}, \lim_{x \rightarrow -3} \frac{x-1}{4} = -1$$

2. [3]

(a) **True**

(b)  $\lim_{x \rightarrow 4} f(x)$  does not exist

(c)  $\lim_{x \rightarrow 4^+} f(x) = 3 - (4)^2 = -13$

3. [2] since  $f(x) = 2x^3 + 9x^2 - 60x$  and using your calculator,

$$f'(x) = 6x^2 + 18x - 60 = 6(x-2)(x+5) \text{ and so increasing } x < 5 \text{ and } x > 2$$

$$f''(x) = 12x + 18 \text{ and so concave up } x > -\frac{18}{12} = -\frac{3}{2}$$