Quiz 3 (Individual) for Mathematics 223
Introductory Analysis I - Spring 1999
Material Covered: Sections 3.1, 3.2 of text and notes
For: 26th February

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

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1. [2] For $f(x) = (3x + 6)^{-\frac{1}{3}}$, $f''(1) =$ (circle one)

(i) -0.024 (ii) -0.012 (iii) 0.012 (iv) 0.024 (v) other

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2. [2] Determine the interval(s) on which the graph of $f(x) = x^4 - 6x^3 + 5x + 17$ is concave up and the interval(s) on which it is concave down.

concave up: ____________________,

concave down: ____________________.

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3. [2] The function $f(x) = \frac{x^2 - x - 6}{6 - 2x}$ has a removable discontinuity at $a = 3$. To remove this discontinuity, define

$f(a) =$ ____________________.

1. **(iv)** For $f(x) = (3x+6)^{-\frac{1}{3}}$,
$f'(x) = -\frac{1}{3}(3x+6)^{-4/3}(3) = -(3x+6)^{-4/3}$
so $f''(x) = \frac{4}{3}(3x+6)^{-7/3}(3) = 4(3x+6)^{-7/3}$
and so $f''(1) = 4(3(1)+6)^{-7/3} = 0.024$

2. [2] Determine the interval(s) on which the graph of $f(x) = x^4 - 6x^3 + 5x + 17$ is concave up and the interval(s) on which it is concave down.
since $f'(x) = 4x^3 - 18x^2 - 12$ and $f''(x) = 12x^2 - 36x$
which is zero at $x = 0, 3$;
and so positive (concave up) for $(\infty, 0) \cup (3, \infty)$
and also negative (concave down) for $(0, 3)$

3. [2] The function $f(x) = \frac{x^2-x-6}{6-2x}$ has a removable discontinuity at $a = 3$.
removable discontinous at $x = 3$ since $\lim_{x\to 3} \frac{x^2-x-6}{6-2x} = \frac{0}{0}$
since $\lim_{x\to 3} \frac{x^2-x-6}{6-2x} = \lim_{x\to 3} \frac{(x-3)(x+2)}{-2(x-3)} = \lim_{x\to 3} \frac{x+2}{-2} = -\frac{5}{2}$, if we define $f(3) = -\frac{5}{2}$, we will remove the discontinuity in this case