Math 229, Section 9 **Home take Examen B**

Instructor: Racovitan Mihai **Due: Monday, 09/25/06**

Name ________________ **Z-number** ___________

Instructions: Answer all questions in the space provided. You must show all work in order to receive full credit.

Ex. 1) Let $f(x) = \dfrac{1}{x^3+3}$ and $g(x) = \sqrt[3]{x-3}$.

(a) (6 pts.) Find $f \circ g$.

(b) (6 pts.) Find the domain of $f \circ g$.

Ex. 2) (8 pts.) Express the following expression in the form $H(x) = (f \circ g \circ h)(x)$.
Emphasize the functions f, g and h . Check your answer .

$$H(x) = \sqrt{2 - \sqrt{x}}$$

Ex. 3) (6 pts. each) Is there a number a such that

$$\lim_{x\to 1} \frac{3x^2 + ax + a - 5}{x^2 - 5x + 4}$$

exists? If so, find the value a and the value of the limit.

Ex. 4) (a) (4 pts.) State the (ε, δ)-definition of the limit $\lim_{x\to a} f(x) = L$.

(b) (4 pts.) Use the (ε, δ)-definition of the limit to prove the following limit .

$$\lim_{x\to -1} (-x + 4) = 5$$

Ex. 5) (4 pts. each) Let $f(x)$ be a function .

(a) State the difference quotient definition of the derivative of $f(x)$.

(b) Find the derivative of the function $f(x) = \dfrac{1}{2x}$ by using the difference quotient definition of the derivative.

(c) Find an equation of the tangent line to the curve $y = f(x) = \dfrac{1}{2x}$ at the point $(1, \dfrac{1}{2})$.

Ex. 6) (6 pts. each) Evaluate each of the following limits. You must show how you evaluated the limit (the simplifications and the laws) to get full credit. Do not use the (ε, δ)-definition of the limit.

(a) $\displaystyle\lim_{x \to 2} \frac{x^4 - 16}{x^2 - 4}$

(b) $\displaystyle\lim_{h \to 0} \frac{\sqrt{3h + 9} - 3}{3h}$

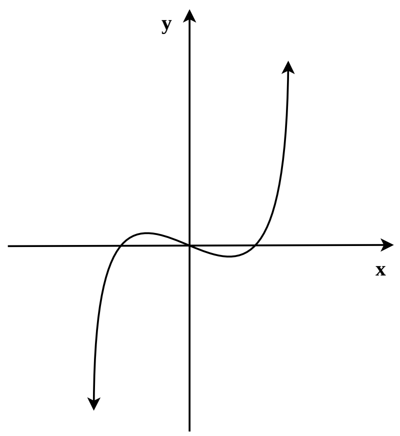
(c) $\displaystyle\lim_{x \to -1} \frac{3x + 2}{x^2 - 3x + 4}$

(d) $\displaystyle\lim_{x \to 0} \frac{1}{x^2(x^2 + 1)}$

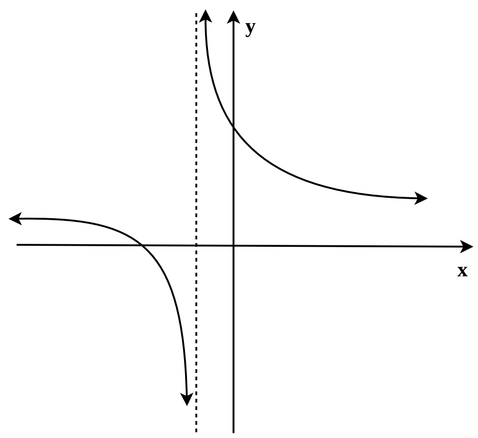
Ex. 7) (6 pts.) Prove that $\lim_{x \to 0} \left(\sqrt{x^2 + x}\right) \cos\left(\frac{\pi}{x}\right) = 0$.

Ex. 8) (8 pts.) Let $f(x) = \sqrt{3x - 2} - 3x^2 + 4$. Show that there is a root of $f(x)$ (i.e. a value of x with the property that $f(x) = 0$) on the interval $[1, 2]$.

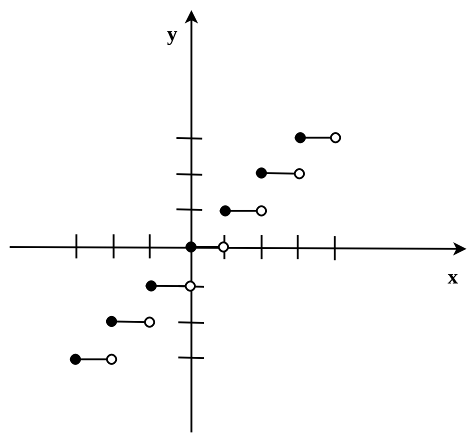
Ex. 9) (4 pts. each) Match the following graphs to the choice that fits the best.



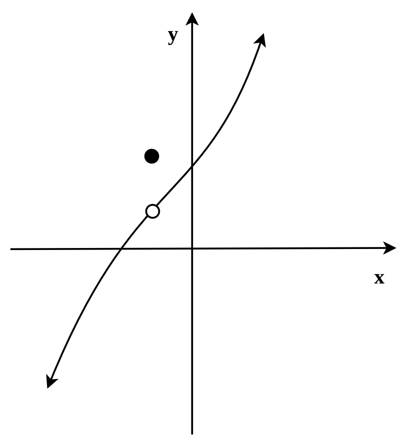
a) _______



b) _______



c) _______



d) _______

i) continuous everywhere

ii) jump discontinuity

iii) infinite discontinuity

iv) removable discontinuity

v) essential discontinuity (other than infinite discontinuity)

vi) nothing applies