Bronx High School of Science
06 October 2008

Mathematics Department
Mr. Shahom, Math Teacher

Name: ________________________________

MA1 Exam 2 Review Sheet

Exam 2 will be on Wednesday, October 8, 2008. The exam is cumulative, but the following topics will be emphasized: limits of piecewise functions, the definition of continuity, finding vertical and horizontal asymptotes and points of discontinuity, the definition of the derivative, the alternate definition of the derivative, and the power rule. No calculators are permitted.

1. Find the derivative of each function.

   a) $y = 3x + 4x^2$ b) $y = \frac{7}{x} + x^{\frac{5}{4}}$ c) $f(x) = 5\pi^2 x - 8x^4$

   d) $h(x) = -2x^5 + 5\sqrt{x} - \sqrt[3]{x}$ e) $g(x) = \frac{x^3 - 3x + 5}{\sqrt[3]{x}}$ f) $y = 5x^{-4} - 4x^{-\frac{1}{4}}$

2. Find all asymptotes and state the coordinates of any removable points of discontinuity for each function:

   a) $y = \frac{4x^2 - 2x}{x^3 - 5x^2 + 6x}$ b) $y = \frac{x^2 - 2x + 1}{1 - x}$ c) $f(x) = \frac{x^3 - 8}{x^2 + x - 6}$.

3. Use the <u>definition of the derivative</u> to find $f'(x)$ if

   a) $f(x) = 2x - x^3$ b) $f(x) = \sqrt{x + 2}$

4. Use the <u>*alternate* definition of the derivative</u> to find $f'(1)$ if $f(x) = \frac{7}{x - 4}$.

5. Given $f(x) = \begin{cases} x^2 - 1 & x \neq 1 \\ 4 & x = 1 \end{cases}$. Which of the following are true? Explain.

   (A) $\lim_{x \to 1} f(x)$ exists (B) $f(1)$ exists (C) f is continuous at $x = 1$

6. If $y = 7$ is a horizontal asymptote of a function *f*, then which of the following must be true?

   (A) $\lim_{x \to \infty} f(x) = 7$
   (B) $\lim_{x \to 0} f(x) = 7$
   (C) $\lim_{x \to 7} f(x) = 0$
   (D) $\lim_{x \to -\infty} f(x) = -7$
   (E) None of the above

7. Find $\frac{dx}{d\theta}$ if $x = 2\theta^{-2} - \theta$

8. Let $f(x)=\begin{cases} \dfrac{x^2-16}{x-4} & x \neq 4 \\ 10 & x = 4 \end{cases}$

Which of the following statements are true?

I. $\lim_{x\to 4} f(x)$ exists.   II. $f(4)$ exists.   III. f is continuous at $x = 4$

9. Find $\lim_{x\to 1} f(x)$, if it exists, if $f(x)=\begin{cases} \dfrac{1}{x-1} & x < 1 \\ x^3-2x+5 & x \geq 1 \end{cases}$

10. Using limits, determine the value of *a* and *b* for which the function $f(x)=\begin{cases} x^3 & x < -1 \\ ax+b & -1 \leq x < 1 \\ x^2+2 & x \geq 1 \end{cases}$

will be continuous for all values of *x*.