MATH 241, Spring 2009
Exam 1: March 11

NAME _____ **Discussion section time** _____

1	2	3	4	5	6	7	8	Total

    Arrange your work as clearly and neatly as possible, and cross out incorrect work. **Unless otherwise noted, you must justify all answers to receive full credit.** You may not use calculators, notes, or any other kinds of aids.

    For this exam, you must use a limit formula to compute any derivative.

1. (6 points each) Let $f(x) = e^{2x} + 1$.

    (a) Find a formula for $f^{-1}(x)$.   (b) Find the domain of f and the domain of f^{-1}.

2. (12 points) Solve $\ln(x) - \ln(x-1) = \ln(2)$ for x.

3. (12 points) Find the exact value of $\arccos\left[\cos\left(\dfrac{5\pi}{4}\right)\right]$.

Reminder: **For this exam, you must use a limit formula to compute any derivative.**

4. (4 points each) Let $f(x) = \begin{cases} \sqrt{|1+x|} & \text{if } x < 0, \\ 1 - x & \text{if } x \geq 0. \end{cases}$

Evaluate each limit, or write DNE if it does not exist.

(a) $\displaystyle\lim_{x \to 0^-} f(x)$ (b) $\displaystyle\lim_{x \to 0^+} f(x)$ (c) $\displaystyle\lim_{x \to 0} f(x)$

Reminder: **For this exam, you must use a limit formula to compute any derivative.**

5. (12 points) Find the limit, or write DNE if it does not exist.

$$\lim_{x \to 1^-} \frac{x^2 - 16}{x^2 - 5x + 4}$$

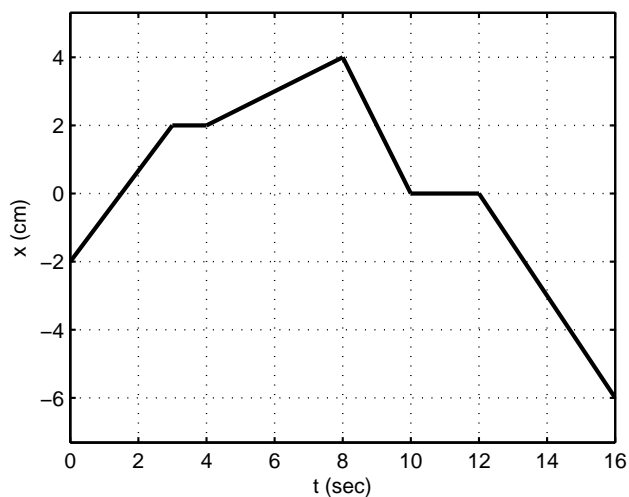Reminder: **For this exam, you must use a limit formula to compute any derivative.**

6. (8 points each) Find each limit, or write DNE if it does not exist.

(a) $\lim\limits_{x \to \infty} \dfrac{1}{\ln(x)}$

(b) $\lim\limits_{x \to \infty} \dfrac{4x^2 - 16}{x^4 + 1}$

Reminder: **For this exam, you must use a limit formula to compute any derivative.**

7. (4 points each) A particle moves horizontally in a straight line according to the position function $x(t)$, whose graph is shown here.

(a) What is the average velocity over $0 \leq t \leq 16$?

(b) At what time(s), if any, is the particle moving to the right?

(c) At what time(s), if any, is the instantaneous velocity undefined?

Reminder: **For this exam, you must use a limit formula to compute any derivative.**

8. (12 points) Find the equation of the line tangent to $y = 3x^2$ at the point $(1,3)$.

Reminder: **For this exam, you must use a limit formula to compute any derivative.**